

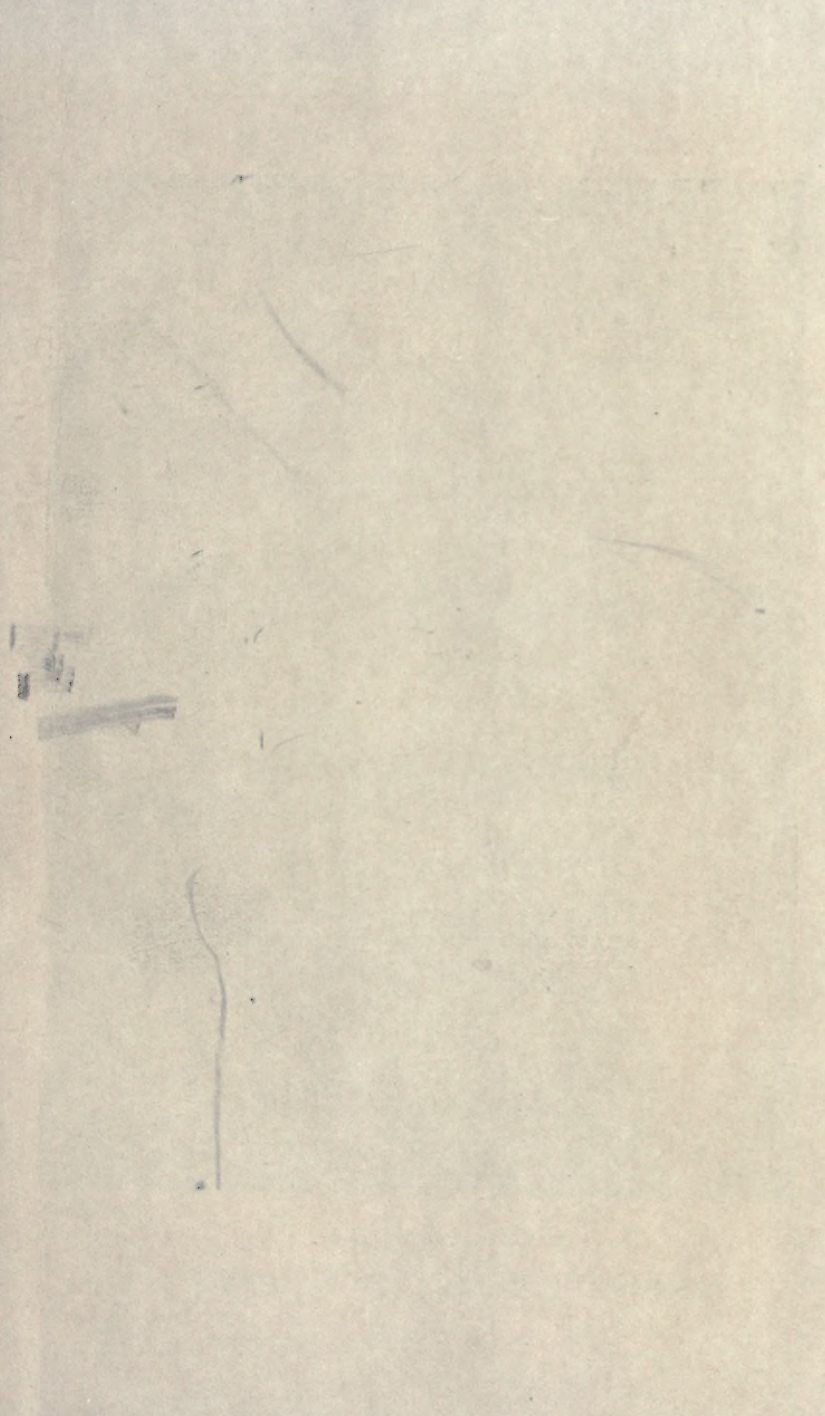




Acane
R2

◀ MAR 17 1993
FEB - 2 1994
FEB 18 1994
JUN 21 1994

DAVID GILL
MAN AND ASTRONOMER





[Frontispiece.]

DAVID GILL, 1884 (ÆT. 41).

(From the portrait by Sir George Reid, P.R.S.A.)

DAVID GILL

MAN AND ASTRONOMER

MEMORIES OF SIR DAVID GILL, K.C.B.,
H.M. ASTRONOMER (1879—1907) AT THE
CAPE OF GOOD HOPE

COLLECTED AND ARRANGED BY
GEORGE FORBES, F.R.S.

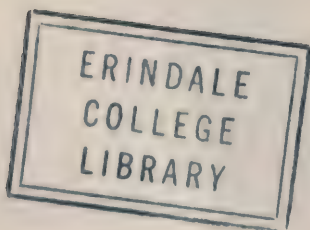
WITH PORTRAITS AND ILLUSTRATIONS

LONDON
JOHN MURRAY, ALBEMARLE STREET
1916

20912

4313

All rights reserved.



PREFACE

SHORTLY before his death Sir David Gill's monumental work, *A History and Description of the Cape Observatory*, was issued by the Admiralty in a handsome volume. Any further complete summary of his scientific work would fill several volumes. Gill's contributions to astronomy are mentioned in this book only as throwing a light upon his character. His friends have expressed a desire to have some memories preserved of David Gill, the man, whom they had learnt to love. Primarily for these friends this book is written. During the twenty-seven years, however, which he spent in raising the Cape of Good Hope Observatory to the highest position in equipment and work done, while astronomers were filled with admiration, the general public were not told much about what he was doing for science and the empire. A secondary purpose of this book is to make his personality, untarnished by self-advertisement, real for those who knew him not, and possibly as inspiring and elevating to some of them as it has certainly been to the biographer privileged to study the innermost workings of his mind.

To David Gill astronomy was almost a religion. This reverence for his chosen science was tempered by human sympathies; and the present book, while telling of his growth, from schoolboy and watchmaker to leader of astronomical research, deals also with his friendships, his delightful social and domestic life, his humour, his enjoyment of the world and his varied employments, among which deer-stalking occupied a special place.

Into all his work and recreations he had the power of throwing an enthusiastic eagerness and joy which were infectious and attracted to him a wide circle of companions in widely varied pursuits.

The secret of the man's great happiness, which he dispensed to all who came in contact with him, was the selfless enthusiasm with which he enjoyed all that is beautiful in the world, and all that is true in human thought. He was a *real* man, and a *real* astronomer. A *real* astronomer, as known to David Gill and the older generations, is one who lives not by science but for science, and who becomes an astronomer not for self-advancement, but only because he cannot help it.¹

The narrative part of these memoirs is divided naturally into three distinct sections.

1. 1843-1879. The Growth of a *real* Astronomer.
2. 1879-1907. The Work of a *real* Astronomer.
3. 1907-1914. The Charm of a *real* Astronomer.

To these are added in two appendices—

Specimens of his lighter correspondence; and a list of his scattered writings, preceded by a list of honours.

My sincere thanks are due for permission to inspect the MSS. in possession of the Admiralty; also to the Directors of Observatories at Greenwich, Cape of Good Hope, Edinburgh and elsewhere, for access to records; and to a large number of Sir David's friends for giving me the opportunity of using the collections of letters written to them by Gill, or supplying me with other material; and most of all to Professors Kapteyn, Hale, Elkin, Dr. Anita Newcomb McGee (daughter of Simon Newcomb), Mr. E. B. Knobel (who has kindly read the

¹ In the Monthly Notices of the Royal Astronomical Society, Feb. 1910, Vol. 70, p. 395, there is an address delivered by the president, Sir David Gill, K.C.B., on presenting the gold medal of the society to Professor Friedrich Küstner. In the course of that address he gives us his appreciation of a *real* astronomer.

proofs carefully and also compiled the Index), Sir Frank Dyson, Mr. Hough, Professor Sampson, Dr. Backlund, Mr. A. Hinks, Mr. R. T. A. Innes, the Earl of Crawford and Balcarres, Lady Darwin, Mr. Clerke, and Miss Violet Markham (now Mrs. Carruthers).

Special mention must be made of the contribution by Mr. John Power, assistant at the Royal Observatory, Cape of Good Hope, with the collection of anecdotes about his late chief which are current at the Observatory. Our best thanks are also due to Mr. W. H. Wesley, the esteemed assistant secretary of the Royal Astronomical Society, for the labour he has bestowed upon the list of Sir David Gill's writings, printed in the Appendix.

Lastly, this book could not have been compiled without the devoted attachment to Lady Gill of friends who have helped her to furnish me with material. We dedicate this book, as a small tribute, to her, hoping that, while inspiring others, it may keep green for many a long day some bright memories of a husband's life; knowing well that the value of his accurate observations and his inventions will not diminish, but will increase, with the centuries.

I have no claim that entitles me to write these Memories except our long friendship. We became acquainted somewhere between 1869 and 1871. By the time when we foregathered at Hamburg for the meeting of the *Astronomische Gesellschaft* in 1873¹ we were old friends, with very similar tastes in astronomy and natural philosophy. He was then working at *Dun Echt*, and I at Greenwich Observatory under Airy. Both of us were preparing to observe the Transit of Venus in 1874; and both of us had just spent a few weeks, quite independently, in inspecting continental observatories. Then again, later, the preliminary work for my measurement

¹ It is a sad reflection that, of all the British astronomers (personal friends of my own) who were members of that association in 1873, I am the solitary surviving member.

of the velocity of light was done on Dr. Young's estate, Durris, near Dun Echt, where I was able to visit the Gills in their home.

During twenty years of my life I was trying to help in building up the infant profession of electric engineering, and our ways parted. But always on his visits home from the Cape we revived our friendship, and twice during his residence there I had the happiness of going to South Africa and seeing him at work. After my profession had become standardised, more entirely commercial, and therefore less interesting as a branch of science, I retired from it, to help in developing some naval and military inventions. Then Gill came home, and in his company I was able to resume my old tastes (it was he who induced me to write my short *History of Astronomy*), while he wrote much of his last book in my "shed" at Pitlochrie—a hermit's library in a pleasant grove.

These are poor qualifications to offer for undertaking the task of writing the Memories. But the wonderful experience of reading his intimate, sympathetic and often racy correspondence has perhaps brought the writer into closer touch with the motives that inspired all his words and acts than contact even with his open and frank personality could alone have done. For, behind his genial accessibility there was a deep reserve, and a refusal to allow his left hand to know the good that his right hand was doing. There is little doubt that, out of all his friends, there is only one woman who knew some of the kind things he did which have now been learnt only through private letters, which cannot be reproduced.

Little mention is made of any trivial controversies into which he may have been drawn. He often enjoyed the fray while it lasted and forgot all about it when over, and certainly he would not desire to have his opponents humbled, or his triumphs proclaimed. His transparent honesty and singleness of purpose to serve astronomy brought him success in many a controversy. He always

gave credit for these qualities to an opponent, and could not conceive the possibility of any one denying them to him, or attributing any personal motive to him.

Every one who had dealings with Gill saw in him the real astronomer. What value will be attached to his labours, centuries hence, the future must decide. We can now estimate the position that was assigned to him in life only by noting the number of honours (governmental and academic) conferred upon him by and through British and foreign astronomical bodies and universities, exceeding those conferred upon any living astronomer. These are enumerated, and precede Mr. W. H. Wesley's list of published scientific works. Such considerations are outside the scope of the present book.

I trust and hope that these memories may lead many a reader to understand the man, his affections, his aspirations, his quests, his hopes, and his joy in being part of this glorious world.

GEORGE FORBES.

*Kinnaird Cottage, Pillochrie,
August 2, 1916.*

LIST OF ILLUSTRATIONS

DAVID GILL, 1884 (ÆT. 41)	<i>Facing page</i> <i>Frontispiece</i>
(From the portrait by Sir George Reid, P.R.S.A.)	
ISOBEL BLACK AND DAVID GILL, LIEUT. 1ST ABERDEEN- SHIRE RIFLE CORPS, BEFORE THEIR MARRIAGE	38
LORD LINDSAY, M.P., F.R.S., P.R.A.S.	70
(From <i>Vanity Fair</i> , May 1878.)	
MR. AND MRS. GILL IN CAMP AT MARS BAY, ASCENSION, 1877	94
THE SOUTHERN MILKY WAY, WITH COALSACK, NEBECULA MAJOR, AND STARS, TRULY PLACED; α AND β CEN- TAURI POINTING TO SOUTHERN CROSS	112
(Drawn from Table Bay by George Forbes, 1914.)	
SIR GEORGE BIDDELL AIRY, ASTRONOMER ROYAL	138
PROFESSOR SIMON NEWCOMB	150
PROFESSOR KAPTEYN	168
THE HELIOMETER HOUSE, WITH DR. AUWERS AND DR. AND MRS. GILL	190
THE STUDY, CAPE OBSERVATORY. MISS AGNES CLERKE WITH DR. AND MRS. GILL	202
ROYAL OBSERVATORY, CAPE OF GOOD HOPE	234
SIR DAVID GILL, K.C.B., F.R.S.	252
THE STUDY, 34 DE VERE GARDENS	322
("We are a very Darby and Joan old couple, who like to be together as much as possible."—GILL to G. E. HALE, Jan. 5, 1909.)	
THE END	360

BOOK I

THE GROWTH OF A REAL ASTRONOMER

CHAPTER I

PARENTAGE AND BOYHOOD (1843-60)

Peter Gill (grandfather)—David Gill (father)—Mother, brothers and sister—Dr. Lindsay—Anecdotes of childhood—College days—Clerk Maxwell—David Rennett.

DAVID GILL was the eldest son surviving childhood of David Gill, watchmaker in Aberdeen, and of Margaret Mitchell, his wife.

His grandfather was Peter Gill, a craftsman of rare ability, who lived to the advanced age of ninety-three years (*b.* 1757; *d.* 1850), and, along with his wife, David Gill's grandmother (Margaret Anderson, *b.* 1757; *d.* 1828), is buried in St. Peter's churchyard, Aberdeen.

Peter Gill was admitted, on September 1, 1783, to the Hammermen's Trade Corporation of Aberdeen. It was he who founded the prosperous business, as a clock and watch maker in Aberdeen, which existed for about a century under the names Peter Gill, David Gill, Gill and Smith, David Gill and Son, at 78 Union Street, now occupied by the Commercial Bank. The business was carried on in the first floor of this house, and the upper storeys formed for many years the residence of the family. Eventually David Gill, senior, son of Peter Gill, removed with his family to another house, at 48 Skene Terrace, to which he made additions. In this house young David was born. It continues, in spite of the westward extension of the town, to stand as a commodious middle-class residence. It possesses a neat garden on the other side of the street, open upon all sides (except for a new

building to the east), and it was in this garden that young David set up his first telescope.

The name of his grandfather, Peter Gill, is still remembered, and even now his clocks are sometimes to be picked up. It is said that he was the last man to walk the streets of Aberdeen in the old-fashioned knee-breeches and fob. He was greatly respected by his townsmen. The family were all Episcopalians.

Under his son, David Gill senior, the business became that of a wholesale dealer in, rather than a maker of, clocks and watches. This David Gill (*b.* May 26, 1789; *d.* April 6, 1878) married Margaret Mitchell (*b.* March 8, 1809; *d.* December 18, 1870) from Savock in the parish of Foveran, some ten miles north from Aberdeen. They are both buried in the parish churchyard of Foveran. Their graves, with those of other members of the family, are enclosed by a railing against the churchyard wall south of the church. In the same graveyard there is another railed enclosure, twenty-five feet by eight feet, containing monuments over graves of the Black family, of which Lady Gill (Sir David's wife) was a member, beginning with the name of Alexander Black, *b.* 1693; *d.* 1769. At a later date, his descendants continued to occupy the farm, Linhead, within a stone's throw of Foveran Church.

David Gill senior died in 1878, at the age of eighty-nine years. He was a magistrate for Aberdeenshire. One of his contemporaries speaks of him as a "very quiet, taciturn man of refined habits and a shrewd man of business." Others refer to him as a hot-tempered man—one of them speaks of him as a curmudgeon, but adds that, in spite of this, he was civil and gentlemanly, and, in his tantrums, was well managed by his wife. Those who were able to get on with him were much devoted to him, and all agree that in his own house he was noted for his hospitality. In his later years his mental activity failed, and business matters devolved

upon his eldest son, David, who became a father to the younger members of the family, to whom he was affectionately attached.

David Gill senior succeeded well in his business. He was thrifty, and acted as his own "traveller." About 1860, Major Robertson's large estate of Foveran came upon the market, and was divided up. David Gill senior invested £19,000 in part of this property, to which he gave the name Blairythan (accent on the "y"), consisting of farms extending over several hundred acres, but with no mansion house.

The family consisted first of Patrick and David, who died in infancy in 1840 and 1841, and are buried beside their grandfather in St. Peter's Churchyard, Aberdeen. Then came David, the subject of this biography, born June 12, 1843; then Patrick Gilbert, born 1845, died 1886; Andrew Mitchell, born 1846; James Bruce, born 1849; and Margaret, born 1851, died 1892.

Of these, David's brothers and sister, Patrick went to Australia about 1863, following the steps of his uncle, Andrew Mitchell (*b.* August 3, 1802; died at Foveran House, April 23, 1878), who made a fortune in Queensland. Pat, as he was called, came home for a visit in 1871. Again, later, after being home, he took his sister Margaret as far as Capetown on his way to Australia in 1881. He also paid one more visit to his brother David at the Cape in 1884 (see p. 163), on his return to Australia after a visit home. Patrick became a magistrate in Victoria, and also for Queensland. He died in 1886, June 21, at Melbourne, where he was buried.

Andrew Mitchell Gill, of Savock and Auchinroath, resides in Scotland.

James emigrated to Australia in 1867, and settled at Runnymede, Victoria, where he still lives with his wife, Ruth. He was home for a short visit in 1876.

Margaret married the Rev. Henry Powell, Rector of Stanningfield, Suffolk. She died, soon after her husband,

in 1892, leaving three sons, who were adopted by Sir David and Lady Gill, and brought up by them in their home at the Cape of Good Hope.

The mother of David Gill seems to have been a particularly lovable woman. She died in 1870, a few months after David's marriage, having been an invalid for some time previously. In later life, when any success came to him, he would say wistfully to his wife, "I wish my mother were alive. This would have pleased her."

Mrs. Mitchell, who in 1858 married David's uncle, writes—

David and his mother were in particular sympathy with each other. She was a very intelligent woman, broad-minded, active, energetic, and, like her son, full of enthusiasm; she was much liked and esteemed by her relatives and friends; I have often remarked, when talking of her, how proud she would have been of her son's success.

Mrs. Mitchell says also that she spent much time with Mrs. Gill in her last illness, and so she learnt from her, what is worth recording, that David used to sit long hours with his mother at that time, and to pray with her.

As a boy, little Davie did not show any precocity. He did not figure as a genius or a prodigy at school or college, but as a cheerful companion with an affectionate disposition to his playmates and a certain reverence for his parents; while his keen enjoyment in the amusements of the moment always made him a general favourite. So say those of his playmates who survive him. They tell of his love of Nature and of truth, the bases of his taste for science. And they all tell how completely he was free, even in childhood, from self-consciousness, and how he felt for others. His scientific enthusiasm, unusual in that community, was looked upon askance as eccentricity, and led his companions to say he had "a bee in his bonnet."

His brother Andrew gives some early recollections.

I remember in the old Skene Terrace days we were always walked to church, St. Andrew's, every Sunday, morning and afternoon, and when we got there, nearly always seated at the top of this seat were our two old aunts, Mary and May, who then lived in Bon-Accord Square, and to that house some of us often went to our midday meal.

David as a lad, I remember, was a great chemist, and had a small room (used at one time by my mother as a storeroom) fitted up as a laboratory in the house in Skene Terrace. [This was after his schooldays.] We were as children all at school with the Miss Chisholms (fine old Highland ladies), whose school was in the house now incorporated with the Music Hall. Afterwards all the brothers in turn went to Dr. Tulloch's Academy, off Crown Street (the school is still standing). We then had also a tutor, Peter Shepherd (the son, I think, of a gamekeeper in the Strathdon district), who afterwards became, I think, a well-known Army doctor. David and Pat afterwards went to Dollar Academy. David did not much wish to go into my father's business.

One of the few souvenirs of childhood preserved by Sir David Gill is a card bearing the following words, received when he was twelve years old—

Certificate of Superior Proficiency in Elocution, awarded by Competition to Master David Gill—"Emeritus" and Prizeman of a former session.

Bellevue Academy, Sept. 25th, 1855.

In 1857, at the age of fourteen, he was sent to the Dollar Academy. He boarded with the head master, Dr. Lindsay, a man with scientific interests in mathematics, natural philosophy and chemistry, the very subjects for which the boy's mind was naturally receptive; and this was his first introduction to science. He used often, in later years, to rejoice in having at that age come into contact with a man so willing to help him in the discovery of his natural tastes, of which up to that time he was unconscious. In 1909, at the request of the

present head master, Dr. Dougal, Sir David Gill gave away the prizes at the Dollar Academy. After speaking of his experiences at the school forty-six or forty-seven years previously, he said—

The Chairman had told them that he had been a very successful man, but he wanted to tell them that if he had been in some small degree successful, the man that put that capacity into him was a Dollar man, the late Dr. Lindsay.

One of Davie's playmates from the age of eight, Gerald Baker, who has been in the Union Bank of Australia, at Melbourne, since the year 1863, when he last saw David Gill, writes to tell of the affection he has always retained for his old playmate, and adds some notes of no particular date.

Davie was a boy that everybody liked, bright, clever, cheery, devoid of self-consciousness, and a stickler for truth. I don't think he made much show in the humanities.

Davie was not a fighting boy, though combative in discussion, like all boys with brains. The only time I ever saw him receive a blow was when he was endeavouring to separate Archie Forbes and Johnny Murray, two of our friends, who were settling some point in Silver Street with their fists. Davie got hold of Johnny, and received a bad blow on the face for his pains.

At Banchory Station these two boys once attended the arrival of the Queen on her way to Balmoral.

We were both dressed alike in kilts—black jacket and waistcoat, silver buttons, brown winsey kilt and tartan plaid (dark blue and green).

Davie learned foil fencing and gave me some lessons in their backyard. Davie used to stand with his back to an old hen house with a trellis front, inhabited by one old hen, which had never been known within the memory of the Gill children to lay an egg. More by good luck

than skill, in one of my lunges I struck Davie on the top of his mask and tumbled him backwards. The old trelliswork got the full weight of his body, and went down inside the hen house with a great crash, Davie on top. He lay motionless, and I thought I had done him some serious injury, especially as strange sounds seemed to come from him. His brother Pattie and I rushed to him to lift him up, but found he could not move for laughter! Underneath him was the old hen, and the noise she made so tickled Davie that he could not get up for some time. We buried her decently.

I remember he started to make a toy steam-engine, but the work of polishing the inside of the cylinder and fitting the piston beat him. He then took up chemistry. His father had a small attic room in their house in Skene Terrace fitted up with the necessary appliances for a beginner, and many happy hours he, Pattie and I spent in searching for elements. We used to rummage in the Rubislaw Quarries for likely specimens, and submitted them to all sorts of treatment, but nothing came of our work but keen excitement and pleasurable expectation.

He never gave me any evidence in those days of his coming great career as an astronomer. If he had become a geologist I would not have been surprised, as he had a strong bent in that direction.

His mental attitude as a boy differed from mine on many things; he was very conservative and prone to hug good old ideas. We quarrelled for some weeks because I sneered at the possibility of the devil having a corporeal existence. Davie stoutly held that such views were highly dangerous, if not blasphemous, but after a talk with his father he admitted that it was a doubtful question, and our friendship was resumed.

As will be told presently, Davie returned from Dollar in 1858 to attend classes at Marischal College, Aberdeen; and during the years 1861-2 was away from home learning the trade of watchmaking, and from 1863 to 1872 was in his father's business.

No letters from David's oldest brother to him have been preserved, though some of David's to him have

been found. Pat was the nearest to him in age and appreciation for, if not sympathy with, his scientific tastes. Neither of the other brothers took the slightest interest in these pursuits. In fact, Jemmie rather despised them, because they were a barrier to the common interests of himself and David, whom he admired greatly. Both Davie and Jemmie were keen volunteers and marksmen with the rifle. James Gill sends the following short note from Australia—

In response to your request I am endeavouring to write what I can remember of my brother Davie when we were more or less boys. Davie was away at school at Dollar up to the time I was about ten years. Then he came back to Aberdeen and went to the University, during which time I had a tutor, and then went to the Grammar School and to the University. From the age of fifteen till I went to Australia in 1867 we were the greatest of pals; we were both of us very proud of shooting with gun and rifle. Davie became a volunteer about 1861. I joined 1864, and we used to go to the rifle range at Nigg,¹ just over the river Dee, on fine mornings several times a week and practise rifle shooting. Davie was always a good shot with both gun and rifle, but he did best with the small-bore at long ranges—800, 900 and 1000 yards. At that time he used a "Henry." He got into the Scottish Eight, but could not shoot—the reason I forget. He won heaps of prizes at different times, and was a most enthusiastic volunteer. Davie and I were about equal with the old muzzle-loading "Enfield," which was the service rifle at that time. I won the Battalion Cup when I was seventeen, beating Davie amongst many others.

As I have said before, I went to Australia in 1867, and saw nothing more of Davie till 1876, when I came home for a holiday. He was living then at Dun Echt, and you

¹ *Note by Mr. Harvey Hall.*—The rifle range James Gill refers to was the one at the Bay of Nigg, on the sea coast about two and a half miles from Aberdeen. Many a day we have shot there together, and often went and shot twenty rounds before breakfast, five miles with a rifle. We thought little of it in those days.

may be sure I saw as much of him as I could. I rejoined the volunteers, and with Davie used to put in a lot of time practising and shooting at the different "wapin-schaws." Of course, at this time Davie was over head and ears in astronomy. I knew it was coming when we were younger. Davie and I would be coming home from a ball, and Davie would "stick up" and would say, "Jem, look at that!" gazing up at the sky. I would say, "Come on, Davie; it's three o'clock." No good—later he would do the same thing. All the same, he was the best of brothers, and had more knowledge—and the reason why—about anything than any other fellow I ever met.

Mr. Alexander Davidson, of Wimbledon, was in his youth a fellow-student with David Gill at the classes of Clerk Maxwell and others in Aberdeen from 1858. They fraternized, and he stayed occasionally for a night in Skene Terrace. He says—

The feature which impressed me above everything else was his immense vitality. He was always keen in everything he engaged in, whether it were work or play, astronomy or rifle practice, sport or dancing. I never knew any one fonder of dancing than he, and he told me a few weeks before his last illness that he still delighted in it. He had in a very high degree the *joie de vivre* which only falls to a lucky few.

I have also happy recollections of accompanying my friend to match-rifle practice on the seashore at the Bay of Nigg, at unearthly hours of the morning. Mr. Gill senior would not allow us to waste later hours of the day in so frivolous an amusement.

On his return from Dollar to Aberdeen in 1858 he attended some of the classes at Marischal College as a private student, the term applied to those not seeking to qualify for a degree. The entries in the students' album are in his own handwriting. In the session 1858-9 he enters himself as "David Gill, aged fifteen, born at Aberdeen, son of David, watchmaker, attending 1st mathematics and natural history." In this session he

also attended Professor Brasier's class in chemistry. In the session 1859-60 his entry is in similar terms, attending 2nd (highest) mathematics and natural philosophy. The prize lists give his name in the first of these sessions as being thirteenth in mathematics. In the second session he is fourth in the regular class of natural philosophy and third in the voluntary exercises for that class. His name also appears in the prize list of the chemical class, 1859-60, in which he is bracketed fourth with James Moir of New Deer. He got no prize for natural history, and in his second session of mathematics his name is not one of the sixteen prizemen mentioned. It must be noted, however, that his mathematics at this date were chiefly learnt from Dr. David Rennett, LL.D., the mathematical "coach" who taught all the best mathematical youth of the university.

It was, then, in the session 1859-60 that Gill distinguished himself in the work of the natural philosophy class, and came under the influence of that great, profound, unselfish and inspiring philosopher, Professor James Clerk Maxwell, in a year distinguished, as Maxwell used to say, for the ability of his students. Nine years later Maxwell wrote in a testimonial—

Mr. David Gill was one of my ablest students in Marischal College, Aberdeen. He was even then devising methods for the experimental determination of physical quantities.

It has often been said of Clerk Maxwell at Aberdeen, as of Lord Kelvin at Glasgow, that his professorial lectures were over the heads of the very young men who attended the classes of Scottish universities. After the lecture, however, he used to remain sometimes for hours talking with three or four of his most eager disciples, showing them some experiment on which he was engaged, or telling them about problems that awaited solution.

Gill's friends of later life must all remember how enthusiastic he became when recounting his experiences under that great teacher. He has told us¹ that Maxwell gave them a few lectures on practical astronomy, "in one of which he exhibited a model of a transit instrument (made out of tin-plate and mounted on wooden piers)." This is interesting, for in the *Life of James Clerk Maxwell* (Macmillan, 1882), at p. 292, we read, in a letter to C. J. Munro, from Aberdeen, dated November 26, 1857—

I have had a lot of correspondence about Saturn's Rings, Electric Telegraph, Tops, and Colours. I am making a Collision of Bodies machine, and a model of Airy's Transit Circle (with lenses), and I am having students' teas when I can.

Again, at p. 295 of Maxwell's Life, we read—

I am happy in the knowledge of a good tinsmith, an optician and a carpenter. The tinsmith made the Transit Circle.

When Gill was shown this model he learnt not only the mode of using a transit circle, but also its errors and the methods used in measuring, and making corrections for, these errors.

A love of paradox as a form of humour is not uncommon among men of great intellect, especially mathematicians. Clerk Maxwell indulged in it so much that many of his serious utterances were regarded by his friends in that light. His astounding proposal, in 1858, for a truly scientific standard of length, to be measured in wavelengths of light,² to replace our arbitrary yard or metre, was regarded by many as a huge joke, until the time came when its value was proved by the most refined experiments. It then became Gill's duty, near the end of his life, to urge upon the International Bureau of

¹ *History and Description of the Royal Observatory, Cape of Good Hope*, 1913, p. xxxi, hereafter referred to as "*History, etc.*"

² The length of a wave of green light is about $\frac{1}{50000}$ inch.

Weights and Measures the importance of defining the metre in terms of wave-lengths of light.

Sir David Gill, in his presidential address to the British Association in 1907, paraphrased a lecture, on the yard as a standard of length, given by Clerk Maxwell at Aberdeen in 1859; and, as illustrating Maxwell's humour, a portion of it is worth reproducing here. Clerk Maxwell is quoted by him as saying of the yard—

At all events, you must see that it is a very unpractical standard—unpractical because if, for example, any of you went to Mars or Jupiter, and the people there asked you what was your standard of measure, you could not tell them, you could not reproduce it, and you would feel very foolish. Whereas if you told any capable physicist in Mars or Jupiter that you used some natural invariable standard, such as the wave-length of one of the D-lines of sodium vapour, he would be able to reproduce your yard or your inch, provided that you could tell him how many of such wave-lengths there were in your yard or your inch, and your standard would be available anywhere in the universe where sodium is found.

This was the whimsical way in which Clerk Maxwell used to impress great principles upon us. We all laughed before we understood; then some of us understood and remembered.

James Clerk Maxwell was, in the opinion of many, the greatest natural philosopher that the world has seen since the death of Isaac Newton, and his great book, *Electricity and Magnetism*, is one of the few volumes worthy to be placed on the same shelf with Newton's *Principia*. Gill had, all through his life, the highest veneration for any man of outstanding genius in his own line of work; and it was inevitable that, having sat at the feet of that great man from the year 1859 onwards, he should have said, towards the close of his life, "His teaching influenced the whole of my future life."

During the period 1858-60, while attending classes at the university, he was at the same time coached in

mathematics and natural philosophy by Dr. David Rennett, the "Routh" of Aberdeen University. This admirable teacher was the idol of all his pupils, many of whom may be met to-day in the town of Aberdeen and within the precincts of the university. There can be no doubt that Gill owed to David Rennett the painstaking instruction that gave him, during the whole of his scientific career, the power to deal effectively, under limitations, with every mathematical problem arising in his investigations. The circumstances of his domestic relations, and his father's fixed desire that he, as the eldest son, should succeed him in the watchmaking business, put all thought of a Cambridge mathematical degree out of the question, though he had in him the stuff out of which senior wranglers were made.

Davie Rennett continued to be one of Sir David's dear friends till his death, and the teacher did not survive this favourite pupil of his a year. Shortly before his own death he wrote out the following—

NOTES CONCERNING THE LATE SIR DAVID GILL

Joined my Classes in November 1858 and was at same time attending Junior Mathematical Class at Marischal College.

Attended the Classes of Senior Mathematics and Natural Philosophy at Marischal College, Session 1859-60.

Very soon got quite enthusiastic over the work in the Nat. Philosophy Class. Was inspired by the then Professor, Clerk Maxwell, which led to a lifelong friendship between them.

When he had finished his course at the University he still kept working at the subjects he had read there, and I then thought he was likely to direct his future work to Electricity; but at that time there were very few facilities for experimenting on Electricity in Aberdeen.

About this time he spent a year at Besançon, a great watch-manufacturing place.

He suggested to some of the university professors that Aberdeen should have a time-gun, and on his proposal

getting a favourable reception he soon carried out the work.

Lord Lindsay and he on their return from the Mauritius stopped some time with the Khedive of Egypt. Dr. Gill measured a base line to be used for a future Trigonometrical Survey of Egypt. The Khedive proposed to him to conduct that survey.¹ He asked my advice on the subject. My advice was not to have anything to do with it unless the financial position was made perfectly clear and safe. Egypt at that time was in a transition state, and the country was under the co-dominion of Britain and France.

D. RENNETT.

To explain. A large number of the students attended my classes in the winter during the College session and also during the summer. So that the future astronomer read with me from Novr. 1858 to April 1860.—D. R.

Sir David Gill was very fond of talking of his old days at college. On November 19, 1908, he presided at the fiftieth half-yearly dinner in London of the Aberdeen University Club. In the course of his speech he said—

I am told that on this occasion the proper thing to do is to recount to you reminiscences—to tell you something of what I remember of my own career when I was there, or rather of the personages whom I encountered. Most of you, I may say, remember the man whom I first went to—that sort of extra-mural professor, Davie Rennett. I remember vividly the grand old Doric with which he used to teach us our mathematics. I remember one of these demonstrations—in optics—and he said, “Well, gentlemen, you know the light goes through the hole there, and it fa’s on that mirror; syne it stots aff, syne it gangs through the lens, and it’s refracted to the focus.” All these things come back to one now, but none of us who were ministered to by Rennett and received his ministrations in a sympathetic spirit will ever forget the debt of gratitude we owe to him. Do you remember Professor Nicol? He was another character. . . . Then there was another man of whom I would like to say something—a man whose memory sticks to me in a thousand ways, and a man of whom I had a tremendous

¹ See p. 78.

idea—that was Clerk Maxwell. He was one of two or three of the greatest geniuses who have lived since the days of Newton, and yet they did not understand him in Aberdeen somehow. He was not a schoolmaster at all. His lectures were terrible, and his experiments always failed—but they were always much more interesting in the failure than if they had gone on. Those of us who chose to stay behind after the class used to get a most delightful hour or two, and learn an immense deal that we never forgot—a great deal that we did not understand at the time, but that came back to us afterwards—until Mrs. Clerk Maxwell arrived, wondering why the professor had not come home to his dinner, and carried him away *nolens volens*.

There was another man who did not belong to Marischal College, but whom most of you who have been at King's knew very well—David Thomson—"Davie," as everybody called him. It was very much owing to Thomson and his sympathy that I began my astronomical career. I used to know him very well. He was very fond of smoking, and Mrs. Thomson did not like smoke. The observatory was a convenient place in which to keep churchwarden clays, and there was a stove there where these clays used to have the old oil burned out. Many a delightful hour I have spent there.

CHAPTER II

CHOICE OF A PROFESSION (1860-3)

Trade *v.* Science—In the workshops—Besançon, Switzerland, Coventry, Clerkenwell—Skill acquired—Lord Kelvin—In partnership—Correct time for Aberdeen—Professor David Thomson—Practical astronomy at King's College.

THE year 1860 nearly proved fatal to David's hopes for a scientific career. Clerk Maxwell left Aberdeen; and David Gill senior, having differences with his partner in the firm Gill & Smith, and being seventy-one years old, insisted that young David should enter the business.

Up to this date Aberdeen University possessed two rival colleges, Marischal College and King's College, each with its own staff of professors and its own revenues. This anomalous condition was at last ended and the junior Professor of Natural Philosophy was retired.

At this time young David Gill, though happy and contented with his place in life, had already absorbed so much of the spirit of genuine science as to be filled with desire, and conscious of power, to follow with humility in the steps of the great discoverers. This feeling set up a positive repugnance to devoting his life to trade. Still, he was not able, or did not consider it right, to oppose his father's wishes. So he finally consented to become a watchmaker, and took up his duties in Union Street. This, however, did not involve a desertion of science, for he still had the little laboratory in the attic in Skene Terrace, and later he set up a telescope in the garden.

Meanwhile, he applied his chief energies to the fulfilment of his stern father's wishes, and arranged with him a

scheme of education in the practical part of the profession, for acquiring, at the great centres of the industry, the mechanical skill required in the art of watchmaking. This course of instruction lasted through the years 1861 and 1862. The great centres for the manufacture of clocks and watches in this country were Clerkenwell and Coventry. On the Continent Switzerland then, as now, held the foremost place. Accordingly the plan finally adopted was to make a preliminary visit to London, spend the next year in or near Switzerland, including Besançon, and, seeing something of Paris on the way, to finish this part of his education at Coventry and Clerkenwell.

A contemporary of that period, Miss Fanny Ranyell, has called up her recollections of the time and noted them in a letter to Mr. Arthur Wilson.

I do not remember precisely how long he stayed on his first visit to London. He went to Switzerland for a time afterwards, and also to Coventry, all for watchmaking, but I could not fit these visits in chronologically. He certainly made more than one stay in London, and at one time belonged to a society, literary and scientific, I think, in Islington, and used to give lectures at the meetings. He used to stay sometimes at your father's house and spent a great deal of his time there when in lodgings. I remember him very, very well in those days. He was always very enthusiastic over everything he did that really appealed to him, but did not care for the watchmaking business. Very good-tempered and happy and taking everything in the best part, even when your father lectured him, which he used to sometimes as he would his own son.

There can be no doubt that these years of work with his fingers, when learning to handle tools and to execute the most delicate construction, by skilful manipulation only to be attained in practice, and the experience in mechanical drawing, were of untold value to him, not merely in its primary object of improving and extending

the operations of his father's business, but afterwards in supplying the technical skill required in the design, construction, alteration and use—with his own hands—of all those delicate instruments and complicated engineering machinery with which he had to deal in later years. These are too often the weak points of a man who adopts astronomy as a profession. Then, again, his acquisition of at least a great fluency in the French language during his long residence in Switzerland, came to be of the utmost value to him later on. These years of application to manual labour and dexterity have probably done more for the progress of astronomy than could ever have been accomplished had he spent them on the study of advanced mathematics.

Long afterwards, when he was carrying on his work at the Cape Observatory, he expressed himself, in a letter to James Nasmyth, March 16, 1886, in these words—

You are quite right in saying, as you do to my wife, that I find the use of tools a great assistance. I assure you the best part of my astronomical education was the time I spent in a workshop. Here, far away from Grubb, or Cooke, or Troughton & Simms, many a mess I should have been in but for that training—and many a change of great practical utility I have made on the instruments here with my own hands.

At the beginning of 1862, on his return from abroad, he went into the workshops of Mr. Wooton at Coventry for six months, and finally completed his training by entering himself as "improver" in the business of Mr. L. Schuessler, a practical watchmaker, then at 23 Spencer Street, Clerkenwell. Mr. Schuessler is still living, and told the writer that it was in the summer of 1862 that David Gill entered his service to gain a knowledge of the London system of manufacturing watches, clocks and chronometers. During the six months he was there he occupied himself busily in this endeavour, and made up a number of watches on his own account. Mr. Schuessler

said that when Gill began with him he was already a skilled watchmaker. He was energetic in searching all Clerkenwell for new ideas. Moreover, in that period he completed a marine chronometer, carrying out in it an invention of his own, consisting of an improvement in the compensation balance wheel.

Among the friends he made in the watchmaking trade at Clerkenwell were the Haswell family, the old firm of Robert Haswell & Son, of 48, 49 & 50 Spencer Street, with whom Mr. Schuessler had almost daily dealings. Mr. James Haswell thus speaks of David Gill in those days—

He was a young man then of delightful and courteous manners, with a cultivated taste, and a true appreciation of classical music. To recall the past is a pleasing task, for all associations with him at that time are very agreeable memories. My recollection is that he was naturally artistic and many-sided, that his gifts and taste were developed by training and cultivation. I may add that at this time we were living as a family at our place of business, and Gill used frequently to call. We much enjoyed his visits, my sisters were musical and he was pleased with their playing. On one occasion he gave one of them a copy of Beethoven's Sonatas which she still has. He came to London with the object of acquiring a wider knowledge of horological art than his home surroundings afforded.

Our business association with him was continued after his return north. We had some transactions with him when he became astronomer at Dun Echt for the Earl of Crawford and Balcarres.

I may also add that the late Sir David was a good shot at the rifle butts in those days. I remember being in Lauder—my father's native town in Scotland—when he happened to be there on a business journey. This must have been about 1864 or 1865. The Lauder Volunteers—I think they became the 5th Berwickshires—were firing, and Gill, with his small-bore rifle, made the best shooting.

Both Mr. Haswell and Mr. Schuessler speak of the

inventive genius displayed by young Gill, especially in regard to pendulums and balance wheels.

All the later friends of Sir David Gill must remember the elegant clock, made with his own hands, which stood on the mantelpiece of his study at De Vere Gardens, Kensington.

His skill in clock design and construction was at first one of his principal claims to notice among scientific men, who very soon began to consult him on points of design. For example, a group of experimenters, members of the British Association, including Mr. C. H. Gimmingham, who constructed Crookes' vacuum tubes, was formed into a committee, to apply the Crookes principle of repulsion in vacuo produced by light as a means for timing the impulse to a pendulum for astronomical clocks without the friction of the usual pallets. Immediately, and as a matter of course, Gill was invited to join that committee.¹

It was not in watchmaking alone that his practical skill and ingenuity were immediately recognized. For example, one day in the 'sixties of last century, Gill, quite a youngster, was in Glasgow, and entered the shop of an optician in Union Street kept by one James White (the small shop which developed into the great engineering concern known as "Kelvin & White"). While standing at the counter looking at some instrument he felt a slap on the back and, turning round, met the beaming face of his old professor, James Clerk Maxwell, who introduced him to his companion, Professor William Thomson (afterwards Lord Kelvin), saying, "You are the very man we want, to give us the benefit of your practical experience." They discussed with him some apparatus, and took him home to breakfast; and he then told his people that he

¹ This committee consisted of "Mr. David Gill, Professor G. Forbes, Mr. Howard Grubb, and Mr. C. H. Gimmingham." See B. A. Report, 1886, p. 56; where the report by D. Gill is printed. It had been read at the Sheffield meeting in 1879. The gravity escapement of his great Cape sidereal clock is here described.

thought it was the proudest moment of his life. This introduction led to a permanent and intimate friendship with Lord Kelvin, for whom he had the most profound veneration.

On his return to Aberdeen, in 1863, his father made him a junior partner, and his firm from that time was known as David Gill & Son.

David Gill's apprenticeship during two years was a symptom of the thoroughness with which he always faced a manifest duty, even so uncongenial a duty as entering upon a tradesman's career. Although during that period he could not make much progress in science, there is plenty of evidence that it occupied his spare time. Still, there is no doubt that his yielding to his father's wish had checked him in his earnest endeavour to find a career in science. Circumstances of no great importance in themselves did, however, combine, at and after the age of twenty, when he returned from his wanderings and settled down to the workshop, in the year 1863, to direct his thoughts more than ever before to the science of astronomy, not as before by reading books, or by gazing at the glory of Orion, but by personal observation and measurement with the real instruments.

His first impulse in this direction was modest enough. He felt that even a humble clockmaker like himself might benefit his town by taking observations with an instrument something like the model of Airy's transit circle which Clerk Maxwell had shown him, and thus giving correct time to the town of Aberdeen.

Accordingly, in the year 1863, while he was still assiduous in continuing his laboratory experiments in the attic of his father's house in Skene Terrace, he sought the acquaintance of the only man now able to help him since the departure of James Clerk Maxwell from Aberdeen. This was David Thomson, a remarkable man, and Professor of Natural Philosophy in King's College.

David Thomson was born at Leghorn, received his

early education in Italy and Lausanne, and became a student in Glasgow University, and a pupil of the mathematical Professor James Thomson, father of the late Lord Kelvin. He then completed his education at Trinity College, Cambridge. After that he returned to Glasgow as assistant in natural philosophy to Professor Meikleham while William Thomson (afterwards Lord Kelvin) was a student in the class. When the professor's health gave way, David Thomson acted for him, and laid the foundation of his own remarkable skill as a teacher. His biographer tells us—¹

The future Peer [Lord Kelvin] and P. R. S. was continually in the laboratory with David Thomson, hearing a great deal about Faraday and his electrical discoveries.

His biographer, whose house at Largs is almost within a stone's throw of Lord Kelvin's, writes, "the younger man has neither forgotten nor discredited the older."

In 1845 David Thomson, at the age of twenty-eight, was appointed "Regent and Professor of Natural Philosophy in the University and King's College, Aberdeen." For thirty-five years he continued to be one of its most effective teachers and, along with his colleague in the mathematical chair, Professor Frederick Fuller, sent up to Cambridge a long array of senior wranglers and high honours men.²

¹ *David Thomson, M.A., Professor of Natural Philosophy in the University of Aberdeen.* A sketch of his character and career. By William Leslie Low, M.A., Rector of St. Columba, Largs, and Canon of Cumbræ.

² It is noteworthy that, in ten successive years, the Scottish universities sent to Cambridge five men who gained the senior wranglership, viz.—

G. M. Slessor (Aberdeen), 1858.
J. Stirling (Aberdeen), 1860.
T. Barker (Aberdeen), 1862.
R. Morton (Glasgow), 1866.
C. Niven (Aberdeen), 1867.

This stern, inflexible professor was much respected by the students.

By patience and perseverance he shaped the policy of the university to provide a scheme, and pressed it in the face of violent opposition, for abolishing the anomaly of two colleges. The "fusion" of these on the lines of his scheme was accomplished in 1860; and the history of the transaction may be read in his biography.

At p. 102 in the biography of David Thomson we read—

Astronomy, too, had great attractions for him, and he spent many hours in the old square tower, which used to be called by the name of Cromwell, in the Observatory which he founded there. It was here that the present Astronomer Royal at the Cape, Dr. Gill, was inspired by Professor Thomson with his well-known enthusiasm for the science of the heavenly bodies.

As a matter of fact it was young David who spurred the astronomical tastes of his senior. He went with an introduction to Piazzzi Smyth at Edinburgh to inspect the transit instrument and the time gun; returned and got Thomson's help to rig up an old instrument at King's College, and observed stars to get the true time.

Every clear evening I used to find my way to his house in Old Aberdeen, whence we adjourned to the observatory and worked with the transit instrument. There was a good sidereal clock, and we added a mean time clock fitted with arrangements for changing its rate by known considerable amounts, or by small known quantities, so that it could without difficulty be set or be kept within a small portion of a second of true Greenwich time. This clock I also fitted with contact springs, so that it could send electric currents, reversed at each alternate second, to control other clocks in sympathy with the observatory standard. A Bain's pendulum was procured from Messrs. Jas. Ritchie & Son of Edinburgh, and applied to the turret clock of the college, which was thus controlled to show Greenwich mean time, and at least one other clock in Aberdeen was afterwards similarly controlled.

Gill tells us that after these services had been reduced to a matter of simple routine, Professor Thomson bought a $3\frac{1}{2}$ in. telescope, 4 ft. focus, by Dallmeyer, equatorially mounted, and they placed it under the other dome, and made attempts to measure double stars, etc. The object-glass was exceedingly good, but the mounting too feeble, the clockwork and slow motions too unsatisfactory to allow of accurate work.

It will be a matter for surprise to many astronomers to learn that, even now, a pilgrimage may be made to this scene of Gill's first efforts in astronomical observing, where the very same instruments, as described by him in his book fifty years later, are standing and in use exactly as he left them. The writer was surprised to find them when at Aberdeen in July 1915. Mr. Anderson, Librarian, and Mr. Clark, who uses the instruments, showed them, mounted in the observatory, as described by Gill. The transit instrument bears the name, "Thomas Jones, of Charing Cross, London." The sidereal clock is by "Sangster & Dunningham,¹ Aberdeen." The mean solar time clock bears on its dial the inscription, "D. Gill & Son, Aberdeen, watchmakers to the Queen." It has a mercurial pendulum with a small shelf on the bob for the adjustment of weights on the shelf. It carries the electric contacts made by Gill, which are still used for controlling a clock on the main tower of the college and for driving and controlling a Ritchie clock in the quadrangle. Mr. Clark said that it used to control a third clock a mile away, in Marischal College, but does so no longer.

The equatorially mounted telescope of 3·4 inch object glass bears the name "A. Ross, London," not "Dallmeyer," as Gill says.²

Looking around, there was found in this room a large card with a list of double stars with particulars in tabular

¹ Who succeeded at Aberdeen to the business of David Gill & Son.

² It appears that Dallmeyer was at one time A. Ross' manager.

form, in the handwriting of David Thomson, just as they left it half a century ago.

Gill's astronomical appetite being whetted by use of these instruments, he proceeded soon to build an observatory of his own, as will be told later.

CHAPTER III

IN TRADE (1863-72)

His pleasures—Astronomy—Art—Rifle shooting—Lieutenant D. Gill—Harvey Hall—Letters to Australia.

THE period of Gill's life from 1863 to 1872 was primarily taken up with the trade to which his father wished him to devote the whole of his life. No doubt young David had the usual experiences of a merchant, touting for orders, cutting out competitors, reprimanding dilatory dealers, travelling through Scotland to extend his business, hunting up bad debts and cutting losses.

No one who knew the David Gill of later years, the zealous and renowned astronomer, can believe that he could ever have enjoyed this commercial drudgery. He did not. He hated it. But his judgment told him it was a duty, so he resolved to make a success of it by patient and dogged perseverance—and he did so. And to this extent these years of trade were not altogether lost years. He discovered, in fact, in himself the "*perfidum ingenium Scotorum*" which served him so well in astronomy. He even confessed in later days that this business training enabled him to deal easily with much correspondence of a kind which is often a cause of worry to many an astronomer.¹

But it must not be supposed that when he shut the office door he was unable to turn to a happier existence. He thoroughly enjoyed life. He had a happy home in his family circle. He loved music, and soon acquired

¹ See p. 233.

a taste for other arts. He had cheerful companions with whom he could roam the country round, at the seaside or in the lovely valleys of the Dee or Don, even to Ballater and Braemar. He enjoyed female society. A picnic or a ball was always a joy to him. Those who joined him in rifle shooting were as full of fun and zeal as he was. He could explore the quarries for geological specimens, and in the evenings could take his chosen friends into his laboratory to experiment in chemistry, mineralogy and electricity. But later on, above all these things—if his day had been worried, perhaps, by the hopelessness of collecting some bad debt—he could always cross the street from his father's house into his temple in the garden when he had established there his observatory and a beautiful telescope, as will be related in the next chapter. He loved this telescope as he might a human being, for the sympathy and comfort that it seemed to bring to him.

These last words have not been written at random or by guessing, but are a summary of what has been told by those who knew him in those years.

The irresistible and compelling attraction of astronomy for the mind of David Gill began only when he discovered the delight of "observing" and of getting information at first hand from the stars themselves, instead of from books, and when he realized the potentialities of his own keen eyesight and delicate touch in handling instruments. Previous to that date his love for the stars arose largely from the emotional and æsthetic side of his character; and this point of view remained with him always. When to wonder, admiration and awe in contemplation of the heavens there is added a personal contact with the objects of admiration, through information due to his own clearness of vision and sureness in manipulation, it is then only that the astronomer knows how immeasurably more real is this knowledge of his than all the dicta of the mere encyclopædist. The personal affection thus created in

the mind of a real astronomer for the planets and double stars and nebulae and comets which he observes extends also to the instruments he has made his own.

But Gill had also artistic tastes. John Brodie, R.S.A., the sculptor, was at this time one of his intimate friends, and it was through the Brodies that he came to know that remarkable painter, John Phillip, who was a native of Aberdeen, in whose studio he spent very happy hours listening to the talk of all the distinguished Scottish artists, and acquired that love of *colour* which never ceased to give him joy. His friendships with Sir George Reid and Colin Hunter brought him later into touch with Millais, Watts and Joseph Israels, and their work, in the years 1876-9.

Up to the age of twenty he was trying to find his own real bent. His family had no scientific leanings, his father had no scientific books in his library. Yet, from the moment he came under the influence of Dr. Lindsay at Dollar, and of Clerk Maxwell and David Thomson at Aberdeen, he knew that it was to science that he must look for permanent interest. But whether the great truths he sought were to come from chemistry, mineralogy, heat, light, electricity, geology, astronomy, or even mathematics, he could not at first tell. He would have made his mark in any one of the branches of exact science. But he spent himself during the early years in search of the sacred fire, and then, as later, lighter pleasures were taken earnestly, and music and even dancing with energy. His best friends at that time did not know in what direction his love for exactness and truth would lead him. His brother Jem alone suspected astronomy, Dr. Rennett electricity, Harvey Hall rifle shooting, his young friend Gerald Baker thought it was geology, many others chemistry, while the Clerkenwell people were most mistaken in saying it was watchmaking.

It was not until, in 1863, he used his hands and eyes

for making astronomical observations, and reducing them, that he knew the direction in which he might hope to find true satisfaction. He was no theorist, but he had an intensely mathematical and exact mind, with great perseverance (as every astronomer who knew him perceived). It may be well to insert here the considered opinion of one of the greatest of those who survive him. Dr. Backlund, head of the Imperial Observatory of Pulkowa, in Russia, has put in writing his own opinion, which is generally endorsed.

He was not a trained mathematician in the strict signification of the word, his career had given him no leisure to cultivate this science especially; but he possessed deep mathematical intuition, which helped him to overcome easily mathematical difficulties appearing in his astronomical works.

If he had chosen mathematics as his special object, he would certainly have ranked among the mathematicians even as high as he did as astronomer among the astronomers.

The fact must now be recalled that at this period (1863 onwards) he was full of business, and shooting became a great enjoyment, when he found that in this direction he might hope to reach the top of the tree.

As his brother Jem has told us, rifle-shooting was perhaps his greatest distraction from business at one time. He was a most energetic volunteer, and joined before the Clerkenwell days. Among the few papers preserved by him relating to these old days, we find his commission as lieutenant in the first Aberdeenshire Rifle Volunteer Corps (now the 4th Gordons) granted by the vice-lieutenant of the county, Sir Alexander Bannerman of Elswick, on March 21, 1868. He retired October 13, 1872.

He soon found that he might hope to become a first-rate shot, and the shooting and drilling gave him good

exercise and genial companionship, even before his skill had brought him into contact with the small-bore crack shots of the county, among whom were included the late Earl of Aberdeen, and that almost perfect man, the Hon. James H. Gordon (both elder brothers of the present Marquis of Aberdeen).

An authentic account of his ability in this field is given in a note written by his most intimate and life-long friend, Mr. Harvey Hall, a well-known advocate in Aberdeen.

He was a fine long-range rifle shot, using a match rifle, was a member of a long-range rifle club, which practised at a range at Dyce, near Aberdeen. In the year 1869 he qualified for the Scottish Eight, to represent Scotland in the Elcho Shield Competition, but was prevented engaging in the competition. His appointment as H.M. Astronomer at the Cape, where he went in 1879, prevented him from following what would have been a distinguished career as a rifle shot.

He was an excellent game shot, and during the few months before his death engaged in grouse-shooting, deer-stalking and pheasant-shooting.

The delight taken by Gill in the accurate performance of his gun and rifle lasted throughout his life, both in South Africa and at home. In his later years he was always a welcome guest on the moors and deer forests of Scotland, and the English coverts.

À propos of shooting, after his return from the Cape to live in London he was sometimes an honoured guest at the Banff Club. On one of these occasions when he was to reply for the guests, the chairman, Mr. Farquharson, M.P., said—

I am told that Sir David Gill is quite an expert on shooting stars. All I can say is that if you saw him on my moor in Scotland, behind the butts in a driving wind, you would say he is an expert on shooting grouse.

Of all his brothers, Pat, the next to him in age, had the

most respect for his scientific tastes, but it was the Benjamin of the family, Jemmie, whose common interest with him was their love of sport and rifle-shooting.

When Jem had gone to Australia in 1867, David seldom bored his brother with astronomy, but wrote to him all the news about rifle practice and "wapinschaws" and the progress of their volunteer corps, as well as about balls and picnics; and the letters that he then wrote serve quite well to show this side of his character.

TO JAMES GILL, IN AUSTRALIA

78 UNION STREET, ABERDEEN,
November 25, 1867.

MY DEAR JEMMIE,—I have to answer your letter from Sydney, and give you such news as I think will interest you. Pat will, of course, show you my letters and others with the home news, so here goes for matters sporting and otherwise.

Pat can give you a letter and papers with details of the Wapinschaw, and the triumphant success of this child.

As to Wimbledon, I couldn't go there as, owing to Papa's illness, the family had migrated to Ballater, and left me here to manage letters alone.

Scotland, you will see, won the Enfield trophy, the Irish Trophy, and only lost the Elcho Shield by *one* point.

That brute McCrinick of Ayr made an awful mess of it, though he made the top score in getting in. Had he shot anything like decently, we should have won in a canter. Innes from Banff should have had the Queen's Prize too, but this would have been almost too much happiness. He scored a centre at 800 yards, which was marked a miss. Had he got this centre he would have been first, but the officer in charge would not allow an orderly to be sent up.

None of the Aberdeen men did much good. Chalmers got £5 in the Prince of Wales competition, and some of the others had trifles.

Wilken managed to nail the Dudley prize, five shots any rifle at 500—seven shots at 800—one prize of £50, open to members of the Eights, and winners of £20. His score was 44444 at 500; 3344444 at 800. He was in the last squad, and when all the others had done he had five shots to fire and must make five bulls to win and did it. He had also an Albert prize of £10—at 500 yards, and I think a running prize.

I went to Montrose in the hope of getting Ross cup. I think I could easily have won it if I could have shot for it, but you know I have given up the Enfield, and the competition was open only to the first three of any competition. My only chance therefore was the 200 yds. any rifle 5 shots. I got a confounded outer the first round, then three bulls—no use—there were three scores of 20. I was awfully disgusted. So I went and asked to be allowed to compete for the Long range, open only to Angus and the Mearns. I was allowed to shoot for practice, and made the top score, five shots at 800, 17; at 900, 18; at 1000, 17 = 52. One point better than my Aberdeen score. I got glory but no money.

At Kelso, Guthrie was anxious for a shot, so he had a party formed when I arrived and we went to the range. We had a competition, 15 shots at 500. I astonished the Kelso shooting world with the following score—

444444444444434 = 59

out of a possible 60.

Ned Sumner shot well, Pat knows him, he made 433434444444444.

I have not done any other shooting, except with Murray Lauder. At the second class target with second class bull's eye and centre I scored 45 in 15 rounds at 1000 yards.

The battalion challenge cup was shot for when I was in the North. Marr won it with a score of 49—you made 52. Peter Cowe told me of a feat by Bill his brother. Tell Pat of it. He saw some geese (Canada) in a pond. He took his breech loader and muzzle loader. Killed one with each of his four barrels, and slipped a cartridge into the breech loader and killed a fifth. . . .

With love ever dear Jemmie.

Ever your affect. brother,

DAV. GILL, Jr.

TO PATRICK GILL, IN AUSTRALIA.¹78 UNION STREET, ABERDEEN,
June 18, 1868.

MY DEAR PAT,—A few lines to tell you what is going on. Before going to news let me tell you that now that A. Stenhouse has gone out you are in no difficulty. Be honest, but look after yourself. Uncle John is too easy, Uncle Andrew says, in these matters, and therefore I say look out. You will require on receipt of this to be sending off the interest on money I raised for you to meet the payment in December, as they look for pay^t punctually on the 20th Dec.

As to what is doing here.

I think I told you that I have got a commission—Lieut. of No. 5 Company. That is two nights a week drill at 8.15. Then I have the Bugle Squad to drill and teach to shoot, that is four nights a week, viz. 7.30 at Nigg on two nights, and 7.30 on old town tacks before parade on other two nights. Add to this a turn at astronomy at night, and an occasional shot in the morning, and you account pretty well for my spare time. We are going to have a great Wapinschaw and review on 30th June and 1st and 2nd July. We have got £180 worth of extra prizes. I have sent programmes to Jemmie, who will show them to you. I will write to him with the result of the shooting and full particulars.

* * * * *

We had a glorious picnic to Inver, above Balmoral. We had rail to Ballater and hired to Inver. We encamped on a jolly grass plot beside the river and opened out our dinner and champagne. We afterwards had a game at Aunt Sally, and drove back to Ballater. On our way we were overtaken by the Queen driving in an open carriage and pair. She passed us. About 300 or 400 yards further on we were overtaken by two of the Princesses and a groom, riding. They passed us and rode in front of us three or four miles. The day was lovely and this little event crowned the whole a great success.

* * * * *

¹ Owing to the failing health of his father, David, from about now onwards, not only managed the business, but to a great extent acted as counsellor and father to the family.

We have the Highland Agricultural Society's show in the end of July. I expect Peter Cowe north to it.

To-morrow we have a bazaar here in aid of the Bible Readers Society, I expect there will be a very full attendance.

Harvey Hall won the Cup of the Rifle Club yesterday. It was presented by the Earl of Aberdeen to be held three times when it becomes the property of the winner. Harvey yesterday got it by a shave, and having won it twice before keeps it. Its value is £30. Be it understood I am not a member of the Club¹ not being a billiard playing and fashionable man, consequently I did not shoot. I think I could have got into the Scotch eight this year if I could have got away to Irvine, but I could not manage that. Scotland you will see lost the Enfield match this year. Walker of Portlethen was much to blame for it. He missed 5 shots at 500 yards, but Scotland had 12 shots to fire and only 18 points to make to win. The beggars of the last squad only made 3 outers in the 12 shots. Send this letter to Jem.

With love ever dear Pat.

Your affect. brother,

DAVID GILL, Jr.

These are samples of many letters written by David to his brothers in Australia during a period when business claimed him by day, and he had discovered a new and absorbing interest at night in the possession of a fine telescope. Then, as always, in correspondence or conversation, he chose subjects in which his friends were interested, never introducing his own personal affairs except when assured of a desire on the part of his friends to listen.

It is interesting to note that it was not till 1863 that he first experienced the joy of real observing with a transit instrument, nor till 1867 with a fine telescope of his own. This line of work immediately became such a source of happiness and satisfaction to him that from now onwards astronomy could claim him as her own.

¹ The Aberdeen Rifle Club, a small social club, with rooms in Aberdeen.

CHAPTER IV

LOVE AND MARRIAGE (1865-72)

He owns a telescope, and photographs the moon—Dr. Huggins—Lord Lindsay—Isobel Black—Canon Low—Lady Gill's memories—The marriage.

PROBABLY the most important event, next to his marriage, in the whole of David Gill's life was the erection of a small observatory in his father's garden. His observations made at King's College had delighted him more than any of the other scientific work he had attempted; but it was not until he acquired a perfectly mounted telescope of admirable definition, that he was able to gauge his own powers in the separation of close double stars, in catching details of planetary, lunar and nebular markings and in micrometrical measurements. Then he began to know, and soon became convinced, that there was no field of work in which he could reap so rich a harvest for science, with his fine eyesight and delicate touch, as in astronomical measurement; and that this work alone would satisfy the craving of his nature, if he could devote all his powers to following in the steps of Bradley and Bessel, of the Herschels and Struves.

Dissatisfied with the mounting of Professor Thomson's small equatoreal, he looked out for the opportunity to buy one with which he could make good micrometrical observations of double stars. He says in his *History, etc.*—

An advertisement appeared in the *Astronomical Register*, in which the Rev. Henry Cooper Key, of Stretton Rectory, Hereford, offered for sale a telescope with a silver-on-glass speculum of twelve inches aperture and ten feet

focus. This he sent to me for trial on a rough wooden stand. I found it gave admirable definition, and I purchased it.

On searching the columns of the *Astronomical Register* it appears that the last date when the advertisement appeared was December 1866. It must have been at that date, or soon after, that Gill purchased it. Probably the greater part of the year 1867 would be taken up in mounting it equatorially and in erecting an observatory for it in the little garden opposite his father's house in Skene Terrace. There was a great deal to be done and he has described how he did it. The principal castings were made, turned and fitted according to his own working drawings by a firm of shipbuilders in Aberdeen. The declination circle, as also the driving circle with its tangent screw and slow motion in R.A., were made for him by Messrs. T. Cooke & Sons of York. He himself made the driving clock with his own hands, and it gave him entire satisfaction.¹

He used this telescope a great deal for the measurement of double stars, and convinced himself that he might thus hope to measure the difference of parallax ² of two stars apparently close together, if one of them happened to be comparatively near to the Solar System. This was considered almost the most difficult feat in astronomical observation. Accordingly he ordered a suitable micrometer from Steinheil of Munich, and about 1871 he was on the point of attacking the measurement of stellar distances, an operation requiring such perfection of instrument and such skill in observing as to have frightened away nearly every astronomer at that time who thought of attempting it.

¹ Eventually this telescope, after purchase by Lord Lindsay, has found a resting place in the Calton Hill Observatory, Edinburgh.

² *Parallax* is an angle which can be measured, and from which we can determine the distance of the object observed. (See footnote on *parallax*, p. 61.)



[To face page 38.]

ISOBEL BLACK AND DAVID GILL, LIEUT. 1ST ABERDEENSHIRE
RIFLE CORPS, BEFORE THEIR MARRIAGE.

There is little doubt that he might have succeeded; but a visit from Lord Lindsay¹ changed his whole life at that period, and put off for many years his attempts to measure the distances of the fixed stars.

Concerning this preparation for measuring the distances of fixed stars, Professor Kapteyn of Groningen, in Holland, has written—

It seems almost a pity that the visit from Lord Lindsay did not come a couple of years later. It might have given us the spectacle—unique in the annals of science—of a business man measuring star-parallaxes in his leisure hours.

Dr. Roberts of Lovedale, South Africa, a zealous astronomer, who was on intimate terms with Gill, tells us²—

It has been my hap to have met one who assisted in the setting up of this now historic instrument, and the stories told of the impetuosity and inventiveness of the young astronomer are instructive as revealing how little folk like Gill change with the changing years. As I heard my friend relate anecdotes of the setting up of the twelve-inch reflector in the garden in Skene Terrace methought he was telling me the story of the erection of the McClean telescope, thirty years later in time.

Another use to which he put his telescope at an early date was photographing the moon's surface at a time when this art was in its infancy, and gelatine dry plates were unknown. In this attempt he was very successful. On May 18, 1869, he was able to take an exceptionally good photograph of the moon. A transparency positive from this was sent to Dr. Huggins, who was then rising into prominence as one of the few pioneers in spectroscopic astronomical discovery. Dr. Huggins appreciated

¹ In 1880 Lord Lindsay became the twenty-sixth Earl of Crawford; and by this name he was most generally known.

² Transactions Royal Society of S. Africa, vol. v. part 3.

this effort and, until his death, always had this photograph in his dining-room window at Tulse Hill.

In the winter 1870-1 Lord Lindsay saw this photograph, noticed its sharp definition and its consequent scientific value.¹ A question regarding it brought the information that it was taken by a young Aberdeen watchmaker interested in astronomy, and with an instrument practically of his own construction. So Lord Lindsay obtained an introduction, and the acquaintance thus begun soon ripened into a close and abiding friendship.

Gill's absolute capture by astronomy was completed during the six years from 1866 to 1872, while he was still bound to his trade in 78 Union Street, while he was still working as a volunteer, while he was still acting *in loco parentis* to his young brothers in Australia, and to his sister Maggie. In 1867 he became a member of the Royal Astronomical Society. He occasionally corresponded with prominent astronomers, and he had much intercourse with Lord Lindsay, helping him in his plans for building an observatory.

There are still some most important events to be recorded that occurred before the turning point of his life arrived in 1872.

His father's health and mental powers were beginning to fail, and in 1869 he handed over to his son David the sole control of the business which had been in the family nearly a hundred years. This event did not add to the responsibilities which had been his, in fact, for some years. But it increased his private means, and enabled him to take the most important step of his life, concerning the beginnings of which a few words must now be said.

David Gill had a cousin, Dr. John Ruxton, in the parish of Foveran, who incidentally and unconsciously, at this period, became the instrument for conferring upon him

¹ This lunar photograph, now historical, came into the possession of the Royal Astronomical Society of London in December 1913.

the greatest boon he was ever granted, and a happiness which shone from him ever after, and filled to the brim that strong part of him apart from intellect, his affections and bright outlook upon the world, his humour, his sympathies and devoted helpfulness.

For, on a certain Sunday morning in August 1865, when the two were on their way to Foveran Church, a walk of three miles, Dr. Ruxton brought him to call at a farm house within a stone's throw of the church, the farm called Linhead, of Mr. John Black. And there he met, for the first time, Mr. Black's second daughter, sixteen years old, Isobel (Bella), his future wife, and they walked together to church.

John Black was the last male representative, in that quarter, of a family long favourably known, especially in the Formartin and Buchan districts. Mr. Black's grandfather Thomas, of Wadrigemuir (*b.* 1725; *d.* 1801), had five sons, of whom Alexander (*b.* 1767) carried on the farm at Linhead, Foveran, for many years previous to his death. His son, John (*b.* 1807), continued the occupation of that farm. In 1837 he married Elizabeth, daughter of Alexander Garden, of Millfield, and had three daughters—Anne, Isobel and Bessie. The second of these became the wife of David Gill.

Lady Gill's mother was a real farmer's wife with a very practical turn of mind, a woman, too, of fine feeling, while he himself took a wider outlook on the world. From an obituary notice we learn—

His company was much appreciated in social circles, where his genial humour and pawky sayings made him a great favourite. He was thoughtful of, and kind to, his poorer neighbours.

In his old age he retired to 18 Bon Accord Terrace, Aberdeen, and died there on January 12, 1885, at the age of seventy-seven. He was buried in the family burying ground at Foveran.

On the occasion of this meeting David was twenty-two years old, and Bella was only sixteen. He saw in her a very pretty girl with a mind to match, full of the fun and cheeriness that never deserted her. David's aunt, Mrs. Mitchell, says that she was very attractive with her bright, intellectual conversation, and that he was desperately in love with her from the first; and adds that, while Bella was naturally bright and clever, her mind had been formed and educated by one of the best of those parish schoolmasters of Scotland—before Scottish education had been ruined by the new School Boards—who were able to detect and foster the natural qualities of their pupils. So Isobel Black had come under the good influence of James Anderson, parish schoolmaster of Foveran, and was in many ways the superior of most girls of her age.

As to what were *her* first impressions of *him* at that meeting; let her speak.

He was then a fine young fellow of medium height, slight, with a supple boyish figure, carelessly dressed, quick of movement, with dark brown hair much dishevelled, from a habit which never left him, of constantly passing his fingers through it, and a twist of humour hovered about the mouth and also twinkled in the eyes. In the eyes, however, there was more than humour. There was a compelling power, an unconscious strength which held one, and which showed that, although unconscious of it, he had already found himself. In fact, it may be said that at twenty-two he was as old for his age as he was young at seventy. He changed so little—in essentials not at all—the eagerness, the honest frankness, the vitality, the quickness to perceive and to respond, the humour, the humanity, the joyousness were all there when we first met and walked together to church, and when he said, "Isn't this the most glorious summer morning you ever saw?" just as they were at the close of his seventieth birthday, when he said to me, "The very happiest birthday of a very happy life." His voice, too, never altered. Although probably to many ears his voice was not a melodious one, being loudly

pitched with a very pronounced Scottish accent *all his life*, yet I have no hesitation in saying, it was the compelling quality of his voice, with its extraordinary variety of tone, which expressed his individuality in a way that made the listener, without knowing why, listen to him and remember what he said. There seemed to be no emotion that it could not express, and it is "The sound of a voice that is still" which haunts my memory every hour.

These two loved each other the moment they met, but they could not impress this fact upon their elders, who would not take their assurances seriously. John Black was charmed with the young man. His wife thought him delightful but altogether too impetuous and impulsive. Really, the parents were very sensible, though the young people could not see it at the time. Thus they had few opportunities of meeting, for the relationship between the sexes, especially in the far north, was hardly so free as now. But the lovers wrote many letters, not love-letters so far as the words indicated, but long, serious, quaint discussions on all sorts of subjects, interesting to both, about which one of them confessed afterwards that she knew nothing at all. But she now says of them—

How earnest and sincere they were! The beginning of the soul's life to me. And to-day I can say that every ideal he then expressed he proved to be real, and every promise he made he nobly redeemed. He never told a lie *even to himself*.

How these letters used to amuse us in after days! and apt quotations from them formed a joke which never palled on either of us.

This very fact used to be to their friends one of the charms of being in their company. So, long afterwards, Earl Grey wrote to Lady Gill about his vivid recollections of—

the most delightful relationship between husband and wife that I have ever looked upon—namely, that which existed between you two. I simply used to love seeing

you two together, and to hear the mutual delightfully affectionate banter and chaff which made us all chuckle contentedly.

When young David declared to his father his resolution to marry there was a stormy scene between these two strong-willed men, because of his youth.¹ When it was over he sought the companionship of an old college chum. This was Mr. W. L. Low, now Canon Low, of Largs, who was then at Kincardine O'Neil, on Deeside. To him he unburdened himself, and Canon Low says that this was the only occasion on which he ever saw young David lose command of hand and eye through the violence of his anger. The incident is told in the course of a note reminiscent of those days in which Canon Low says—

I became acquainted with the family of which Sir David Gill was the eldest son about 1858, at which period I was a student at the University of Aberdeen. At that time the younger sons were being educated at the Parsonage, Monymusk, by the Rev. William Walker, on whom his University afterwards conferred the degree of LL.D., and his Church the office of Dean of the Diocese of Aberdeen. I spent the College vacations at the same delightful place, reading hard under the stimulus and inspiration of Mr. Walker. It was thus that I came ultimately to know the whole family of the Gills, and to be a guest now and then in their hospitable house in Aberdeen.

When I was a young clergyman at Kincardine O'Neil (1863-70) young David came now and then in the summer-time to spend a week-end with me. I think we both enjoyed these week-ends—I know I did. We both had a great liking and admiration for Professor David Thomson, and for the Natural Philosophy of which he was Professor, and seldom met without one or other of us having some new story to tell of "Davie" and his ways of dealing with unstudious students.

One attraction for David Gill which Kincardine O'Neil possessed was a rifle-range; and when he came for a

¹ David's father was 49 years old when he married.

week-end he brought his rifle. It was the muzzle-loading Enfield rifle of those days; but we both were capable of hitting a target with it, and did so often on the Saturday afternoon.

One of these afternoons has frequently come back to my memory, because of the contrast it brought to the placid and happy David Gill at all other times known to me. He was like a Vesuvius in eruption, in fact, if possible, still more vehemently and threateningly excited, and the usual equable sequence of his thoughts was equally disturbed. After some time of excited utterance the *fons et origo mali* became clear. Young David had, like other young men, fallen in love with a bright young personality that looked at him through a pair of bright eyes matched delightfully with a rich complexion—and old David had apparently forgotten his own youth and failed to approve. Young David was full of wrath and expressed it forcibly. He thought his father had claimed the right to marry his own wife, and ought to allow the same right to his son. I sympathized with young David; and as time went on no one rejoiced more than I did as the constancy of his affection was manifested, and its discernment vindicated by the object of it proving through a long married life an ideal wife.

But that afternoon David Gill's mind was in a state of storm. After luncheon we went to the shooting-range, and he was as keen as ever on making bull's eyes. But his attention was always flying off to his trouble; and when loading for the fourth time his preoccupation with it caused him to put the bullet in before the powder, and the shooting came to an end for the day.

The two lovers both came to see that the waiting time had been a blessing in disguise. Moreover, it was necessary from a material point of view, for at the date, 1865, when they first met, David had only lately become his father's junior partner in the business, with a small enough income.

The year after his father's retirement (when young David had become head of the firm), on July 7, 1870, shortly before his mother's death, David Gill married Isobel Black from her father's farm at Linhead, and

they started on their honeymoon for Pitlochrie, in Perthshire.

Thus began that happy married life. Their first house was in Aberdeen, two or three hundred yards away from his father's house in Skene Terrace and from his observatory in the garden. His widow's words must tell the rest.

Twenty-six North Silver Street was a comfortable but rather ugly little house, and the furniture, which I thought beautiful and David did not think about at all, atrocious. But to us both a very heaven of happiness lay between its four walls, as it always did between every four walls which held us two to the end of his life.

In the first years of our married life I quickly realized what I had had more than a glimmering of before, the intensity of David's love of Astronomy, and it became fully borne in upon me that my young husband's life could never be accomplished while he remained in business. I can see now the radiant look on his face, and the exultation in his voice after a night spent with his telescope. Often when this had been specially apparent, I used to pray so earnestly that a door might be opened for him to pass into the land of his desire although it seemed then as if only a miracle could bring it to pass. In 1872 the miracle happened, and he became Director of Lord Lindsay's Observatory at Dun Echt. The door was opened and he entered into his Canaan.

David's mother died in December 1870. Her loss increased the value of his married life to him. David and Isobel Gill never had any children, but their devoted affection, sympathy and help, each for the other, in sickness or health, as well as their fun and badinage, became an object lesson to all who knew them intimately.

David's young wife never, at any time of her life, attempted to become an astronomer; and for this he was thankful. A lady once was heard, on being introduced to him, to say, "And how nice it must be to be helped by your wife. I suppose she knows all about

astronomy?" To which he was heard to reply, "Not a word, thank God!" But in times of perplexity she knew what he required, and in times of triumph she gloried in his success. In every moment of his relaxation, and in days of absence from home, to the very end, his intimate friends could see that his every thought was with her.

CHAPTER V

LORD LINDSAY (1872)

LORD LINDSAY'S interest in the astronomical work of Gill the watchmaker soon developed into deep appreciation. Young Lord Lindsay, even at the age of twenty-four years, was a very remarkable as well as a very able man, constantly experimenting upon life's experiences, yet always critical and self-reliant. Conscious of the power he possessed, due to his qualities as much as to his wealth, he was determined to use it as seemed to him best. Having decided upon a course of action, nothing could stop him.¹

In the 'sixties of last century he established a laboratory in Greek Street, Soho, at great expense; and this was the first direction in which he started for the love of science. This was before the days of dynamos, and Lord Lindsay built up, on the roof, the most powerful electric battery in the world at that time, and fitted in the laboratory the largest electro-magnet. A good many years later he devoted both wealth and influence very successfully to developing the new profession of electric engineering.

It is worthy of note that one of Lord Lindsay's objects in making his great electro-magnet was his expectation that some physiological action might be experienced by placing the human head in a strong magnetic field. He failed, but after many years the late Professor

¹ Afterwards, Lord Lindsay was elected a Fellow of the Royal Society, and became President of the Royal Astronomical Society.

Sylvanus Thomson, F.R.S., demonstrated the truth of his surmise.¹

While the laboratory in Greek Street was in active operation Lord Lindsay arrived at a very sound judgment about astronomy. As Sir William Huggins has told us, after the discovery of Neptune had put the final seal upon the universality and completeness of the law of gravitation in the solar system, the problems of planetary motions seemed to be ended except for the mathematician. At the time referred to (about 1870) comparatively few young men of great ability saw that there was much to be gained for science by the devotion of a life's work to astronomy. Lord Lindsay's studies, and his appreciation of Huggins's spectroscopic work, led him to think differently. His intimacy with the watchmaker astronomer confirmed his opinion, and he conceived the idea of inducing his father to found upon their estate at Dun Echt, thirteen miles from Aberdeen, the greatest private observatory in the world. Lord Lindsay contemplated not only a large telescope, but an observatory to approach or equal Greenwich in the accuracy of fundamental astronomy of position.

It appears from correspondence still existing that, long before the time when their forces were combined in any agreement, Lord Lindsay and Mr. Gill were in close contact, the younger and more influential man consulting the older one in regard to best lines of work, and the best instruments to lay down, in a large private observatory.

It is much to the credit of Lord Lindsay, who was only twenty-four years of age when he made Mr. Gill's acquaintance (his senior by four years), that he quickly learnt to regard him as the most capable person he knew, if his interest could be secured, to organize and help to use his private observatory.

¹ Roy. Soc. Proc. B., vol. lxxxii, p. 396, and *Journal of the Röntgen Society* No. 32, vol. viii.

All through life it must have been a great satisfaction to the future Earl of Crawford to know how much astronomy is, and always will be, indebted to him for his sound judgment at that time.

In December 1871, one evening while Mr. and Mrs. Gill were sitting together at home in North Silver Street, the curate who acted as chaplain at Dun Echt called, and, holding out a letter, said that Lord Crawford had asked him to deliver it. Gill laid it on the table and conversed with the chaplain till he left. Then he opened the letter. He read it, and, with controlled countenance, handed it to his wife. She read, and exclaimed, "How glorious!" It announced Lord Crawford's intention to build an observatory for his son, and invited Gill to become its first director.

It must have been a moment of combined gratification and perplexity.¹ Here was he, a young man, in control of a prosperous business ensuring him and his wife ample means for life. Here was a wife whom he loved, and who had so lately given herself to share his fortunes. Here was a father who would look upon his desertion of a thriving business and an assured future as a betrayal of his inheritance, and long-headed relations who would condemn him as a flighty visionary who could drop the substance for the shadow, and accept a small allowance in exchange for a small fortune.

On the other hand, here was an opening to the land of his day-dreams, an opportunity to show his worth in the only line of work that could give him complete satisfaction. Here was the means offered him to make a start in the footsteps of men standing foremost in his regard, whose names are held in perpetual veneration—perhaps even to have his name inscribed alongside of theirs.

To a man like Gill, who was humble, unselfish and

¹ In this connexion, read his letter to Mr. Bryan Cookson at pp. 232, 233.

strict in his sense of duty, yet full of zeal and confident of his skill in certain directions, an immediate decision might well seem difficult. It all depended upon his wife. But in her mind there was no doubt whatever. This was the answer to her prayers.

There was no longer any question about the answer to Lord Crawford's invitation, though there was a great deal of opposition on the part of the father. In the summer of 1872, when some instruments were on the spot, and while the foundations of their own future home were being laid in the park, the Gills migrated to Dun Echt, living at first in a part of the mansion house, so long as the family were away, and afterwards occupying a small farmhouse, Scotstown, two miles from the observatory.

From this moment David Gill ceased to be the business man with a delight in astronomy as a hobby. He was now fairly launched in the astronomical world. From now onwards he is an astronomer first, and he has no business except his hobby. It is not often that an astronomer has the opportunity twice in a lifetime, as Gill had, practically to create, equip and use a magnificent observatory in accordance with the highest ideals. Dun Echt Observatory, which with instruments and library was transferred to Blackford Hill, Edinburgh, by the late Earl of Crawford (our Lord Lindsay), and presented to the nation, and the Cape Observatory as it now stands, are to a large extent the creations of Gill's genius and the most substantial memorials to himself. The large volumes, numbering about thirty, containing results of his work—including Dun Echt publications, Annals of the Cape Observatory, Geodetic Survey of South Africa, and Cape meridian observations—together with his contributions to the Royal Astronomical Society and to astronomical literature generally,¹ will remain for

¹ A list of these, compiled by Mr. W. H. Wesley, is appended to this volume.

ever a permanent record of the skill, energy, fixed purpose and perseverance which carried this man through a life of noble endeavour.

His talents did not lie in the mathematical fields occupied by Newton, Laplace, Adams, Leverrier or Newcomb; but the accuracy of his work recalls the memory of Bradley, his careful selection of types of instruments recalls W. Struve, his inventive genius and indomitable perseverance recall Tycho Brahe, and his self-expenditure for the sake of future generations of astronomers recalls Hipparchus. Whether he is to be enthroned alongside of these great astronomical observers of precision will be settled in the future.

It must not be assumed from what has now been said that, at the date when Gill was appointed to Dun Echt, Lord Lindsay had not laid out the whole scheme of the work as a result of his own studies. We who knew Lord Lindsay in those days remember with appreciation the beginning he had made. He had already made up his mind to take part in observing the Transit of Venus from the Isle of Mauritius on December 9, 1874. There is abundant evidence that much of what was done at Dun Echt was based upon a careful study of W. Struve's book describing the erection of the Pulkowa Observatory, and Gill showed a greater interest in that observatory than almost any in the world. The resolution to establish a prime-vertical transit at Dun Echt, and to use a heliometer in the Mauritius expedition, show, further, the influence of Pulkowa. Accordingly, it seemed to be interesting to see the copy of Struve's book which Gill must have read, to ask for it at the University Library in Aberdeen, and perhaps to find scraps of paper with Gill's notes in it. To the writer's astonishment, he found they had no copy. Also, Gill never possessed a copy. It seems nearly certain that Gill used Lord Lindsay's copy; and, if so, it becomes very possible that, when Gill was appointed, Lord Lindsay had already taken Struve as his model.

Even if the main details had already been settled by Lord Lindsay, the rest of the work was one of co-operation, though Gill alone was almost permanently on the spot; and the part taken in it by David Gill can be appreciated by the letters written by him at that time, a few of which are published in the next chapter. Part of their agreement was that any work done by either should be published in their joint names, and this agreement was loyally upheld by both parties.

CHAPTER VI

DUN ECHT (1872-4)

Building up an Observatory—Preparing for Mauritius—Gill's first photographic *réseau*—Pulkowa visit—The Hamburg astronomical meeting—Disastrous gale—Preparations for Transit of Venus complete.

“ Happy is the man who has found his work !
Let him ask no other blessedness.”

CARLYLE.

THE making of an astronomer and director of an observatory is well told in the Dun Echt letter-book, filled with Gill's correspondence from 1872 onwards,¹ and in the Lindsay Archives.² Instruments and buildings for the permanent observatory were in progress, and also portable ones for the Mauritius expedition for the Transit of Venus in 1874 (December 9).

Gill's duties included design of instruments, ordering them, urging their completion, and superintending building operations. A glance at the letters shows him urging Troughton & Simms to complete the great Transit Circle and the portable altazimuth; T. Cooke & Sons are asked to report progress with the prime-vertical transit, clocks, equatorials, and buildings. Grubb has the 15-inch equatorial, with spectroscope, on hand; and is called on for all sorts of subsidiary apparatus, for Gill found in Howard Grubb a kindred spirit keen to advance astronomy. Merz of Munich is dealing with the 15-inch objective prism; Repsold of Hamburg with the heliometer;

¹ Preserved at the Royal Observatory, Edinburgh, and lent to the writer by Professor Sampson.

² Lent to the writer by the Earl of Crawford and Balcarres.

Ausfeld of Gotha with the Zöllner photometer; Eichens with the 16-inch siderostat; Dallmeyer with the 40-ft. focus lens for photography; Apps with induction coils; Williams & Norgate or Quaritch with books. The town of Aberdeen sends printed forms, masons, tools and supplies. Chronometer makers are asked for the hire or purchase of fifty chronometers. Discussions arise with astronomers about astronomical photography and the best modifications of the Huggins or Secchi type of spectroscope; with Airy about improvements for Dun Echt upon the new Greenwich standard clock; with Auwers of Berlin and others about using the new heliometer for the solar parallax by observations of Mars or of Juno.

At the same time he superintends the building of his own dwelling-house, as well as the fixed observatories. It was at this time that one of Lord Crawford's men said about Gill: "I wadna say what he may ken aboot astronomy, but this I wull say, that he'd mak' a gran' mason." He was certainly endowed with much adaptability, and would take a turn at anything that needed doing, and do his best.

Lord Lindsay was much away, in London or abroad, but always in touch with the "Director." The letters between these two men show their loyal devotion to each other and to their mistress, Astronomy. Lord Lindsay, as Chief, made every decision himself, and Gill was punctilious in submitting every matter to his Chief before acting.

On February 1, 1872, Lord Lindsay, in Rome, tells Gill all about Secchi's object-glass prism. On July 15, 1872, in Munich, he says he has ordered such a prism from Merz, and adds—

I have very nearly settled to take a house at Heidelberg next year from March to June, as I want to work up some German and mathematics. . . .

I went to the observatory here yesterday to see

Lamont,¹ and was talking away in French when to my intense surprise he addressed me some question in broad Aberdeen Scotch. He has been fifty-two years away, and has almost forgotten English, but has not lost the accent.

TO PROF. OTTO STRUVE

OBSERVATORY, DUN ECHT,
March 7, 1873.

DEAR SIR,—Accept my warmest thanks for your kind and cordial letter of the 20th Feby. I forwarded it to Lord Lindsay, and we are both agreed as to the desirability of attending the meeting of the German Committee for the Transit of Venus, and the meeting of the "Astronomische Gesellschaft" at Hamburg. . . . I will then arrange my visit to the Continent so as to first visit Pulkowa, and be in time to attend the meeting at Hamburg on my way home. By this plan I hope to have the pleasure of seeing you at Pulkowa, and possibly also afterwards at Hamburg.

I assure you I look forward with a prospect of great pleasure and advantage to my visit to your splendid observatory, now that your kind letter makes me so sure of a welcome.

Believe me, very truly yours,

DAV. GILL, Jr.

TO HOWARD GRUBB

THE OBSERVATORY, DUN ECHT,
April 2, 1873.

MY DEAR GRUBB,— . . . Now about another matter I wish you to be putting on paper.

A photograph of the sun being taken, say during the transit of Venus—it is required to ascertain whether any shrinking of the film has taken place, and if any, to measure it.

The method we propose to adopt is to rule a series of lines on a plate. Immediately after the photograph is taken the plate which was exposed (a dry plate) is put in a pressure frame and exposed behind this plate long enough to photograph the lines upon it on the plate which has before been impressed with the image of the sun.

The plate is then developed and fixed, and we have on it an image of the sun and of the ruled plate.

¹ [Discoverer of the connexion between sun-spot periods and terrestrial magnetism, *Annalen der Physik*, lxxxiv, p. 580.]

We know the true distance of the lines on the ruled plate. The difference of the lines on the developed photograph is the contraction. The lines being sufficiently close so that by interpolation we can find the shrinkage of any point relative to any point. . . .

Yours always,

DAV. GILL, Jr.

On March 20, 1873, in a letter to Professor Henry Draper, in America, he says—

As the prospect of an early dissolution of Parliament has involved Lord Lindsay in politics and he is about to contest the Borough of Wigan, his time, you can thus very well understand, is much occupied.

During 1872, Gill had correspondence with Airy about the Transit of Venus and about Jupiter's satellites, as well as clock construction. On March 25, 1873, he sends to him his own observations for latitude on eight nights with the new altazimuth as a test of the accuracy of its work.

On December 19, 1872, he gives to Messrs. T. Cooke & Son, of York, his suggestions for the control of a rotary pendulum; and later he discusses the same with Grubb.

In 1873 his tour of foreign observatories and the meeting of astronomers at Hamburg were important events in his life.

To JAMES GILL (in Australia)

THE OBSERVATORY, DUN ECHT,
Nov. 27, 1873.

MY DEAR JEM,—It really is a very long time since I wrote to you.

* * * * *

I suppose my news must begin with my visit to the Continent. Well, I left Leith about the first August, by steamer for Hamburg, along with the Rev. Prof. Smith¹ (called Hebrew Smith), one of the clever Smiths of Keig. This was a Saturday, and the following Monday afternoon we steamed into Hamburg. On Saturday night we parted—he for Leyden and I for Copenhagen

¹ [Professor Robertson Smith.]

via Kiel. I arrived at Copenhagen the following day about noon, saw some of the sights, visited the Observatory, Prof. D'Arrest and Schjellerup, had a night at the observatory, and a walk and various glasses of beer with the Professors, and left next day steamer and rail for Stockholm.

I had a Swedish bath there, a new sensation. You are popped into a bath, hot water turned on, and you get hotter and hotter, and an old woman scrubs you all the time with a brush and soap, cracks your joints, and so on.

Stockholm is a lovely place, quite intersected by arms of the sea—and no omnibuses, all steamers—there are about eighty of them continually plying. I arrived at Stockholm early in the morning and left by steamer at midnight for St. Petersburg. The navigation is entirely through islands, and so you can only travel by day. We stopped the first night at Abo, the next at Helsingfors, and the next evening at St. Petersburg. You pass about 5000 islands, and altogether the sail is a most charming one. We had delightful society and a most pleasant trip. The approach to St. Petersburg is very fine. First Cronstad, with its awful strength—the old, huge granite forts which Charley Napier did not knock down, which all the Russians say he might have done, and the low, iron-plated forts, so awfully strong with 11-inch Armstrong guns, and a narrow channel full of torpedoes, and such a channel that a ship must run the gauntlet of all the forts to get in—speak of a place impregnable.

Then the towers of St. Petersburg come into view—long thin minarets and splendid domes richly gilt—in fact, covered with gold, they say, as thick as half a sovereign. There I found two astronomers and a carriage waiting me, to drive me out to Pulkowa, thirteen miles off, where I arrived at eleven o'clock p.m. I got a most warm-hearted welcome from Struve, and went to bed. I need not tell you all the glories of Pulkowa, but greater kindness I never met in my life. Fancy 150 people all living under one roof. Five families of astronomers amongst the number, and, of course, five married ladies, all in harmony together—that is a marvel, is it not? They have each their separate suite of five rooms and can be as private as they like, but they have jolly parties and have great fun.

When I had been there four or five days I was taken

ill—thought it was indigestion and tried castor oil—worse and worse—so went to St. Petersburg. Struve sent me in with his brother-in-law, who looked me out an hotel and a doctor. Doctor said my digestion was all right, but that I had inflammation of the membrane of the lung and had caught it by cold at night. Recommended a good dinner, a bottle of good wine, and cold water bandages. That dinner did me a world of good. I had starved myself and hoped thereby to get well, and got worse. After three days I was able to get up and leave with Struve for Hamburg (fifty-two hours by rail). I stopped to rest at Berlin for a couple of days, and got much better there. Then on to Hamburg, where the meeting of the Astronomical Society took place. We had every day grave meetings from nine to four, and then all off by steamer somewhere and had a jolly dinner together. I met and made the acquaintance of all the great men of the day, and enjoyed this very much.¹

On the Saturday (I reached Hamburg on the Tuesday) Lord Lindsay joined me, and on the Monday we were invited to take part in the deliberations of the German Committee for Transit of Venus—so down we went to Hanover. There we stayed till Thursday, and then off to Paris, where we arrived on Friday morning. Spent Friday and Saturday there and then straight home to Aberdeen.

Then Mr. Grubb arrived to put up our big telescope. Now Mr. Simms is to be here with our Transit Circle. We have started a time-gun. We are putting up the tents and houses that go to the Mauritius, and all together I have been busy as possible since I came. Bella sends the domestic news.

I have been twice Roe shooting—five were killed on each occasion, but I did not get a chance. We had the usual great day with the Pheasants, 270 head, 185 Pheasants, 13 guns. I have had two days at Blairythan: 10 brace, 9 hares and some rabbits; and 6 hares, 7 brace, 6 rabbits. I will write Pat next mail. My time is up. I am delighted to hear that things are looking better.

Your loving brother,

DAVID.

¹ The present writer has a vivid recollection of the Hamburg meeting. He and Gill were already old friends with common tastes (both preparing for Transit of Venus expeditions). At Hamburg they did everything in common. Argelander, the

Twenty-one years later Gill wrote to Professor Simon Newcomb—

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
July 17, 1894.

MY DEAR NEWCOMB,— . . . Do you remember our Congress of 1873—at Hamburg and Hanover? There I first met you, my good friend, and Auwers and Winnecke and a host of others who have been dear to me ever since. The stimulus which that meeting gave me goes on still. What did I not learn in that short time? What friendships, useful and dear to me ever since!!

In the autumn of 1873 the arrival of Howard Grubb at Dun Echt to set up the great equatoreal and of Mr. James Simms to erect the Transit Circle were memorable events.

TO HOWARD GRUBB

THE OBSERVATORY, DUN ECHT,
October 7, 1893.

MY DEAR GRUBB,—I should have written to you before now—but the Heliometer came just after you left, and that had to be mounted, and on the Wednesday morning I left for some shooting and only returned yesterday.

I had a splendid night the Sunday you left. Not very steady for high powers, but very clear.

* * * * *

I sent Lord Lindsay the following telegram: "Night and telescope splendid. Lamp damnable."¹ I did not exaggerate. The lamp made me use very unwontedly strong language. . . .—Always yrs., DAV. GILL Jr.

doyen of the meeting, and also Struve, took them under their charge. The other most intimate friends were Auwers, Winnecke, Bruhns, Repsold, Peters, Rumker, Schönfeld, Tietjen, among the foreigners; J. C. Adams and Huggins were the British members. Newcomb represented the United States. They also met Zöhrer and v. Asten. Every interval in the daily work was occupied by the two young enthusiasts in a visit to Repsold's works, to inspect Lord Lindsay's Heliometer.

¹ [Expletives of this kind were occasionally used by this essentially pious man, never for the injury of any one but only according to old Scottish custom (so it is related by Dean Ramsay) as "an offset to the conversation."]

From this date the heliometer became his pet instrument, for he was perfectly astounded at the minute accuracy of his observations with it.

The first intimation of an intention by Lord Lindsay and Mr. Gill to use the heliometer at Mauritius for observations of the minor planet Juno, as a second method for getting the solar parallax, appears in the postscript of a letter to Dr. Auwers of Berlin.

1874. March 2.—P.S.—The Heliometer observations come out so beautifully that I almost think a good determination of the parallax¹ of Juno might be made from the parallactic displacement due to the Earth's rotation. [The note proceeds to detail his preliminary investigation.]

At the same time he writes on the same subject to Brunnow and also to Hind.

¹ *Parallax* is an angle which can be measured and from which we may derive the distance of an object. Standing at some fixed spot in your garden you may see a church steeple due north. If you move your position four yards eastward, the steeple seems to move a little to the west of north; one degree west if it be distant 230 yards; two degrees for 115 yards; half a degree for 460 yards, and so on. Thus if you measure the degrees or fraction of a degree by which the steeple's direction seems to be displaced, you are measuring the *parallax*, and can tell the distance of the steeple. An observer on the equator is carried daily (by the earth's rotation) 4000 miles (the earth's radius) to one side or other of the earth's centre. The consequent change of a planet's direction is its parallax, and if this be measured, its distance can be found. An observer is carried every year (by the earth's revolution) 93,000,000 miles (the sun's distance) to one side or other of the sun. The consequent change of a star's direction is its parallax, and if this be measured, its distance can be found. The change of direction from the direction as seen from the earth's centre in one case, and from the sun in the other, is called the *parallax* of the planet or star. The term *solar parallax* is commonly used to mean the maximum parallax of the sun at its mean distance as observed by a man on the equator at sunrise or sunset. The more correct expression is *the mean equatoreal horizontal parallax of the sun*. If, in the above terrestrial example, we substitute 1000 miles for a yard, it can be applied to the moon when it has an observed parallax of 1° . The man's displacement from the earth's centre at moonrise or moonset would be about 4000 miles (the earth's radius), and the moon's distance about 230,000 miles.

On March 27, 1874, he answers inquiries from C. Niven about spectroscopic work, and especially radial velocity measurements of double stars.

One of the most interesting binaries, I think, will prove to be Procyon. I send you a memoir which my friend Dr. Auwers has recently sent me ¹—please return it. The motion of Procyon in line of sight could be well determined.

As the time available shortened, his anxieties about the non-delivery of instruments increased. The forces of Nature, too, gave him the opportunity for testing his self-reliance, and for clear thinking at the supreme moment of apparently irrevocable disaster. To give an example of this. We find in his correspondence the whole history of his setting up the 40-ft. photographic lens, by Dallmeyer, in conjunction with the 16-inch siderostat, by Eichens, and the photographic plate-holder in the focal plane, by Grubb, each being mounted on a separate masonry pier, and housed.

We find him writing in great glee at the success of his preliminary trials. Then comes a letter to Lord Lindsay.²

DUN ECHT,
February 27, 1874.

DEAR LORD LINDSAY,—Yesterday after I wrote you the gale rose still higher—about 1.30 with a fearful gust it veered more to the East, caught the Siderostat House on the side, threw it over and smashed it to pieces carrying with it Siderostat, 40 ft. O.G. stand and all. The same gust, getting under the floor of my old observatory, forced open the door, lifted off the roof, and threw it smashed in pieces fifty yards off.

I got men at once, and we got the siderostat removed in pieces into the observatory.

I am thankful to say the damage done is far less than

¹ [The celebrated computation of Procyon's orbit, round the invisible companion indicated by Bessel, computed by Auwers, and discovered by Schaeberle with the Lick Telescope in 1896.]

² Lent with others by the Earl of Crawford and Balcarres from the *Archiva Lindesiana*.

I anticipated. The mirror is safe, and so, I think, is the polar axis, but we cannot say until we have got it in the lathe; we are just taking it to pieces for that purpose now.

The sliding arm at back of mirror is bent, and that must be renewed; the aluminium arm and the slow motion in Decl. part are somewhat twisted, but not more, I think, than we can manage here. Botts really has behaved splendidly, and shown an amount of anxiety and real usefulness and interest which, I think, we sh^d not forget.

The upright pin upon which the mirror turns is bent, but we have looked out a piece of good steel (an old chisel), and Botts will make a new one.

The closest shave, and most lucky escape, is the 40-ft. lens. It was broken off from the upright which carries it, its cell squashed and bruised in an awful way, and yet it seems all sound unless it gets some permanent flexure from the present state of strain in which it must be.

I send it off to Davis to-day asking him to take it himself to Dallmeyer, get his report on it, and urge its speedy repair.

I propose, if you think well of it, after we have found out what parts of the Siderostat require to be renewed, to take the pieces and run up with them myself to Cooke's and see them put in hand. I will first require to set the new houses going on Monday and Tuesday, and to receive Carpenter,¹ and go on Wednesday. Let me know if you think I sh^d do this.

It was just touch and go with the big dome. I don't think I ever spent such an anxious day. Had we not, just a few days before, arranged a new plan of fixing down the horizontal shutter by putting a bar across it so [sketch and description], it would have been blown away—and then nothing could have saved the dome.

One of the plates in the roof has been slackened from its rivets, and it was only by keeping this slack plate always away from the wind that the dome was saved. The weathering was most effectual.

The Heliometer room we dared not open yesterday. To-day we find it full of water, and the floor of the chronometer room in a flood by water blown under the door.

¹ [From Greenwich Observatory, engaged as Gill's chief assistant for Dun Echt.]

The Transit Room is absolutely dry. I think you should order that wooden porch.

I enclose a letter just come from Auwers which will explain itself.

I have a lot of things to do before post time.

In haste, always sincerely yours, DAV. GILL, Jr.

These are the occasions that count in the education of an engineer, who only by experience can learn, if he has the self-reliance to meet disaster. But his trouble with the 40-foot lens was not yet over. It was returned to him in a new cell apparently perfect, and, greatly relieved, he writes as follows—

TO MR. J. H. DALLMEYER

THE OBSERVATORY, DUN ECHT,
March 26, 1874.

MY DEAR SIR,—I am happy and thankful to say the *restored* lens has arrived safely. May the gods reward thee.—Yours very truly, DAV. GILL, Jr.

But on April 7 he has to write a long letter to him, beginning as follows—

I am sorry to tell you that what I feared is true. The 40-foot lens gives a double image. Ah——

This letter goes on to describe in detail the infinite pains he took in locating the trouble. The siderostat mirror was tested and found to be perfect. The fault was definitely located in the lens. By turning the component parts of the lens separately in their cell as well as both together, and observing a pin-hole in a metal plate at the focus of a collimator, and by testing for strain by polarized light, he was eventually assured that the trouble was wholly due to faulty curvature of the crown-glass.

So a new crown-glass lens had to be made; and at last, on May 25, not so long before his date for sailing, he was able to write to Dallmeyer—

I have just tried the 40-ft. There is now *no* double image by the test I described before. . . . The rays come very sharply to focus— $\frac{1}{8}$ inch is easily detected. Spherical aberration must be very perfectly corrected.

So once more, for the time, all is well, and *that* trouble a thing of the past.

Among the minor anxieties, as the time for sailing approached, was the collection and rating of fifty hired or purchased chronometers for differential longitude determinations between Aden and Mauritius. This and the connexion of longitudes by telegraph between Aden and Greenwich were a very important part of the Transit of Venus work. Finally the plans for the voyage had to be changed, and it was decided that Gill by himself should carry the fifty chronometers and a portable altazimuth direct on a P. & O. steamer to Aden and thence tranship to Mauritius, while Lord Lindsay with the bulk of the instruments and assistants should travel by the Cape in his yacht *Venus*, of 380 tons. The preparations for this responsible duty, all alone, naturally gave Gill some anxious days.

The collection of the chronometers, and testing their rates, was difficult; but other delays in the last few weeks were heartrending. On April 11, 1874, he writes to Mr. James Simms: "I am very much disappointed that you have not answered my enquiries about the altazimuth. I do sincerely hope that you will at once see to its being sent off, when I explain the very responsible position in which I shall be placed and with only that instrument to rely upon." And again, on April 14, he again writes to Simms: "It will be a most serious matter for me if you do not at least approximately fulfil y^r promise of sending the Altazimuth in a few days."

On the same day he writes to Messrs. T. Cooke & Sons: "Are you going to drive me *mad*? You will if you go on in this way."

These urgent representations succeeded. On April 28

he tells Simms : " The Alt. Az. came last night and seems very fine."

On June 2, 1874, he answers part of a letter from Davis in these words : " A line to say that if you don't write me till I am not busy our correspondence is likely to come to an untimely death."

To the same correspondent he is more explicit on June 7.

Just a word now about my being busy. You seem to think it strange my being so. Tupman¹ not so.

1. Capt. Tupman had ever so many trained assistants. I had next to none.

2. Capt. Tupman was in the midst of instrument makers. I 500 miles away from them.

3. Capt. Tupman had all, or nearly all, his instruments a year ago. I had not half of ours a month ago.

4. Captain Tupman had no chronometer expedition to arrange and no Heliometer work to labour at. I had all his different observatories as well, and to determine all the constants of the instruments *with* my own hands.

5. Capt. Tupman had all forms of observation and computing done for him. I had to do them all myself.

6. Capt. Tupman had nothing to do but Transit of Venus work, I the regular work and superintendence of much going on here besides. Tupman had no chronograph experiments, which occupied a fortnight of my critical time.

I think you will find my work has been Tupman's $\times 3$, not $\div 3$.

In the end it was a satisfaction to find that he could leave Dun Echt, on his way to Mauritius, conscious that his efforts had been successful and that every instrument was ready. He was able to witness the transport of his portable astronomical village by steam traction engine into Aberdeen for shipment.

¹ [Captain (now Colonel) Tupman, R.M.A., was taking charge, at Greenwich Observatory, of all preparations for all the five British Expeditions.]

CHAPTER VII

THE MAURITIUS EXPEDITION (1874-5)

The outward voyage—Night fishing—Lord Lindsay's arrival—Return to Egypt, and surveying operations—Khedive's offer—Good-bye to Dun Echt.

THE Archiva Lindesiana contains the MS. of a lecture delivered to a select circle by David Gill at Aberdeen describing his voyage to Mauritius with the chronometers, while Lord Lindsay, with assistants and instruments, in his sailing yacht, *Venus*, was going round the Cape. The MS. gives the reader some faint notion of his difficulties when making observations of stars for time in the short stoppages he had at Suez and Aden. Still more graphic are the anxieties he experienced in dealing with Arab boatmen when transporting his valuable and easily deranged chronometers. And the labour of comparing fifty chronometers twice a day in the course of a severe attack of sea-sickness rouses our compassion.

Having transported his fifty chronometers from Liverpool, where they had been rated, to Greenwich, he started from that observatory alone, in charge of them on two cabs, leaving Airy and his assistants bewildered at his temerity.

He shipped them at Southampton on June 18, 1874, in specially fitted cabins, with entire success. He reached St. Denis in Mauritius on August 3. Here he was welcomed by Mr. Meldrum, and made all his preparations to set up the instruments when they should arrive with the yacht, which did not happen until the beginning of November, owing to bad weather. He was able to give assistance to Transit of Venus observers from England,

France, Holland and Germany who were to be stationed at other islands. In this way he met Captain Wharton, commanding H.M.S. *Shearwater*, who was conveying the British observer, Mr. Neate, R.N.,¹ to Rodriguez. Captain Wharton afterwards became Hydrographer to the navy and so became very intimate with Gill, in whose house at the Cape Observatory he died in 1905.

The astronomical results of this expedition have been published elsewhere and need not be described here in detail. But the MS. contains some account of the manner in which the spare time was spent while waiting for Lord Lindsay's arrival.

The spot chosen for the observing station, on climatic grounds, was on a part of the island which had been brought into cultivation, with astonishing results, by a delightful and remarkable Frenchman, M. de Chazal. This patriarch of the settlement was pleased to do all he could for the astronomers. Gill was delighted to see the effects of his energy, perseverance and taste upon a bleak volcanic area. M. de Chazal with his sons, daughters, and their children, all lived and worked together at St. Antomi. When Gill arrived, after a little talk the family sat down thirty to breakfast. Several sites were offered; and when "Belmont" was chosen carpenters were soon at work on the house, and masons were levelling and building pillars for instruments. Every kind of amusement was provided when the yacht failed to appear. A particularly graphic account of a night's fishing on the coral is full of life.

Having accepted an invitation from Rudolph de Chazal to spear fish on the reefs round Amber Island, we set off one evening about five o'clock. The carriage took us to the beach, and the boat (named after the Prince who used it) the *Prince Alfred* took us to the Island. Here we put on old clothes, and sailed for the reef about a mile out to sea. The flambeaux (great bundles of small pitchy sticks bound together) are lit and we step

¹ Commander Neate, R.N., died June 13, 1916.

out upon the reef up to the knees in water. Here we separate into parties of two or three, each party being accompanied by a black fellow carrying a lighted flambeau over his shoulder. It was already quite dark. Each flambeau lighted up clearly a little space around, showing the dark waves breaking white on the reefs, becoming still and green as they pass inside the basin. In the distance each party in its illuminated circle is seen clear and distinct passing off to its fishing ground, or a sportsman stopped over a pool with uplifted spear ready to strike.

But this strange effect of light is not so strange as the scene under foot. The reef is like a road, broken up by deep pools and fissures and flooded with water—but what a road! So beautiful! so variegated! Coral every shape and colour, wonderful animals, bunches of seaweed—all the wonders of tropical submarine life—new to me and beautiful.

Behind is Amber Island, only visible by the huge wood fire on which dinner is being cooked, and the other fishing parties getting smaller and smaller in the distance.

Now for our own proper work, we come to a hole and I see only a wonderful natural aquarium—"See," says Rudolph, but I see nothing. "Ah, he is gone," and I was too late, again and again too late, and then at the next hole I thought I saw a curious long blue stone, it moves, down plunges the spear and a struggling at the end told I had struck. "Keep him down, keep him down to the bottom," cried Rudolph—"now"—and up with the spear came a large blue fish with a bill like a parrot—and called the parrot fish. The Malabari took him off and put him in a bag and we passed on.

This fish proved to be the largest we got that night, but we had a wonderful collection of fishes gold and silver, red and blue and grey, and wonderful appetites for the excellent dinner we found waiting us on Amber Island.

The September mail brought the Aberdeen carpenter with the houses for which there was no room on the yacht. The anxiety caused by the non-appearance of Lord Lindsay's yacht became great, and it was not until November 1 that a welcome messenger arrived to say that Lord Lindsay and Dr. Copeland had left the yacht in a calm with the steam launch, and were at the Hôtel de l'Europe in Port Louis.

Among the caricatures of eminent men that used to appear in *Vanity Fair*, by Spy (Leslie Ward), none was truer to life than that of Lord Lindsay, in May 1878. There are still a good many people who remember the young Lord Lindsay of those days, his geniality, his remarkable personality and his mannerisms, as well as the fierce expression he could assume on occasion, with his red hair and beard and his blue spectacles, and the temptation is irresistible, to insert here (*literatim*) the manner of his unannounced arrival, as given in the local paper.

LORD LINDSAY

Drôle d'histoire, tout de même, que celle que je vais vous raconter.

Elle a le privilège d'être vraie, c'est ce qui fait qu'elle sera encore plus difficile à avaler.

Donc la voici :

Le noble Lord—disons-le noble, puisqu'il l'est de par ses titres,—débarquait il y a quelques jours parmi nous.

A peine arrivé, la faim le prend, et il se fait conduire à un hôtel quelconque.

Il était vêtu comme son maître d'équipage, c'est à dire qu'en le voyant on n'aurait pu savoir à qui on pouvait avoir l'avantage de parler.

Milord, donc, se rend à l'hôtel, et le dialogue suivant s'engage entre lui et le restaurateur.

— Bonjour monsieur.

— Bonjour.

— Je voudrais bien prendre quelque chose.

— Que désirez vous ?

— Avez-vous du sherry ?

— Oui.

Et l'hôtelier le regarde, avec l'air de se demander :—
" mais peut-il payer ? "

Le costume du visiteur répondait négativement à cette importante question.

— Servez moi, dit milord.

Et comme l'hôtelier se grattait la tête pour savoir s'il fallait obéir, ou non :

— " Qu'est ce que vous avez ici de bon à manger ? "

— J'ai du rostbeef. . . .

— Nô !



LORD LINDSAY, M.P., F.R.S., P.R.A.S.

REPRODUCED BY PERMISSION FROM "VANITY FAIR"

MAY, 1878

— J'ai du plumpudding. . . .

— Nô !!

— J'ai du jambon. . . .

— Nô !!! Donne-moi des sandwiches.

Tutoyé, l'hôtelier se cabre.

— Ah ! mais permettez. . . .

— Assez causé. Servez moi !

Enfin on le sert avec une perplexité croissante. Milord boit, mange, se rince la bouche, jette sa serviette, et se lève.

— Pouvez-vous me donner une chambre ? dit-il.

— L'hôtelier qui tremble pour sa consommation, répond aussitôt :

— Ça dépend . . . nous verrons ça tout à l'heure.

— Ah ! . . . bien ! dit milord.

Et mâchant son cure-dents, il s'éloigne dans la direction de la porte d'entrée.

En deux bonds, l'hôtelier franchit le perron, et le rejoint.

Milord se retourne et le toise.

— Comment appelez-vous ce monument ? dit-il, en designant le palais de justice.

— Ça, c'est la Cour ! dit l'autre visiblement agacé.

— Et cela ?

— Ça, c'est la cathédrale.

— Ah ! très bien ! très bien. Joli ! Ah ! bien joli . . . bonjour !

L'hôtelier qui se croit joué, se plante héroïquement devant lui :

— Mais les consommations se payent comptant ! s'écria-t-il.

— Ah ! dit milord qui ne comprend rien à son air, — très bien !

Et tirant des souverains de sa poche il en donne un à l'hôtelier ébahi.

— Attendez que je vous rende le change ! dit ce dernier subitement calmé.

— Nô ! gardez.

— Mais si fait !

— Nô ! je vous dis gardez.

— Mais, monsieur, je n'ai pas besoin de recevoir un cadeau de vous.

— Nô ! gardez. . . .

— Mais monsieur. . . .

MILORD S'ÉLOIGNE.

— Au fait, continue l'hôtelier, comme vous m'avez demandé une chambre, ça se retrouvera entre nous. Sous quel nom faut-il vous inscrire?

Milord se détourne alors, et avec le flegme britannique :

— Lord Lindsay ! dit-il.

— Lord Lindsay ! . . . Milord ! pardon ! pardon Milord !!! s'écrie le malheureux hôtelier. Je ne savais pas ! pardonnez moi.

— Ouais ! très bien . . . arrangez la chambre.

Et il sortait les deux mains dans les pôches, tandis que l'hôtelier saluait à reculons.

The valuable work accomplished by Lord Lindsay's Mauritius expedition is accessible to all astronomers in the Dun Echt publications. Clouds interfered with the critical observation to get the time of apparent internal contact of the edges of Venus and the sun. But they got photographs and heliometer measures during the transit of Venus, as a black spot, over the sun's surface.

It is a lamentable fact that, at least in Gill's opinion, the net result of all the costly private and national transit of Venus expeditions amounts to this : that the time of true contact cannot be fixed with certainty, and that this method for determining the sun's distance cannot be relied upon, and is useful only as a check.

Lord Lindsay and Gill had, however, another string to their bow. The heliometer was used for measuring the distance of the minor planet Juno, then in opposition. This result gave for the sun's distance a value which we now know to be close to the truth. But the work was not done under the best conditions, owing to the delay in the yacht's arrival until after the planet had passed the most favourable position. This experience nevertheless convinced Gill that the best method for getting the sun's distance would be found in heliometer observations of a minor planet in opposition.¹

¹ See the extremely able articles on Solar Parallax by D. Gill, in *The Observatory* for 1878.

The chronometric longitude determinations were of great value to astronomy and geography. But the grandest result for astronomy of this expedition was that it made a man. Gill's reputation as a most accurate observer and organizer was established; he had gained confidence in himself to carry out any such work, however difficult, that he might undertake; and he had proved the value of the heliometer by the accuracy and consistency of his own observations.

On January 8, 1875, Gill sailed from Mauritius with chronometers for the final work of connecting the longitudes of Belmont in Mauritius with (1) the Isle of Reunion, (2) The Seychelles, (3) Aden, (4) Suez, (5) Alexandria, (6) Malta, (7) Berlin. He arrived at Aden on January 20; and some interesting facts are given in a letter to Lord Lindsay's mother at Florence.

TO LADY CRAWFORD

ADEN,
January 23, 1875.

DEAR LADY CRAWFORD,—I am very glad to hear that my letters have interested you, and still more so that you are pleased with the arrangements I made at Mauritius. . . . We have had so much to do in Mauritius, owing to the late arrival of the Yacht, that we have been all overworked, and a few days before I left, Lord Lindsay was quite knocked up. . . . The Aden Mauritius steamers as you know are not very good, and there was a very fine steamer coming which should sail from Port Louis for Ceylon. Lord Lindsay was to avail himself of this. . . . To complicate matters Dr. Copeland became ill and we lost his assistance for ten days. But we were fortunately favoured with very clear nights, and all this great mass of work has been done between Xmas Day and the 6th Jan^y, and I believe thoroughly well done. . . .

At Reunion I went ashore at once and got Dr. Oudemans to come on board, bringing his chronometers with him. Their error was determined the previous night, and so the comparison we then made was the means of connecting Reunion in the circle of longitudes of which Belmont is the centre. . . .

I was very anxious to determine the longitude of Mahi, the capital of the Seychelles, . . . as Captain Wharton is making it a point from which to determine the longitudes in his survey of the coast of Africa near Zanzibar.

I had to land an instrument on arrival and determine time by sun or stars or whatever I could get,—but because of measles at Bomba [?] we were put in quarantine. I then applied to the Captain to be allowed to land on the Quarantine Island. . . . The little Captain, however, was in such a rage at being put in quarantine that he would not allow me to land, or what was the same thing would not give me a boat to go, and I was in despair when to my great delight I heard the cheerful voice of my friend Captain Wharton—"Hullo Gill, are you there?"—He had been detained on some surveys of reefs on his way to Seychelles, and hearing we would be put in Quarantine had turned out all his officers during the day to observe equal altitudes of the Sun for time, and had come off himself to get one of Lord Lindsay's chronometers for comparison with his own.

He had previously obtained permission from the health officer to be allowed to receive two chronometers, "*if they were previously disinfected.*" I applied to the Captain to send the chronometers.—"What! chronometers! send chronometers! Where? Who? What? Have I not told you you cannot go?"

"I don't wish to go—only to send chronometers."

"But you cannot—impossible—quite impossible."

"Will you not assist me?"

"No, I shall not. Why should I?"

"In the cause of science."

"I know nothing of science, only money."

(I must tell you the Captain always when excited takes every astronomer for a Prussian because he has four Prussian astronomers on board and it is almost too much for him.)

"But it is of importance."

"Important or not it is nothing to me. They have put me in quarantine, and am I to break quarantine for your sake?—you whom I carry only because you pay."

"What do you mean?"

"Ah, pardon, I thought of these Prussians."

"Well, Captain Wharton is there and has obtained permission to take two chronometers from the ship."

" Eh—what—obtained permission, you say? "

" Yes."

" To land chronometers ! They make exceptions for him and they will not allow me to land anything. Very good, I will write to the Governor."

" Yes, I think you are quite right. You should allow me to land the chronometers, and then you will have good cause of complaint."

" Exactly."

So the chronometers having been duly rubbed with vinegar were put into a boat and dropped astern when Captain Wharton received them, and the little Captain retired to his cabin where I saw him for a long time furiously composing letters to the Governor. . . .

On passing through Egypt [on the way out] I happened to meet one of the surveyors of Egypt—he told me of the commencement of a survey of the country. . . . The consequence was first a private letter asking if I would undertake to measure a base line in Egypt. I asked Lord Lindsay's consent, and he has kindly given it. . . . I have on arrival here an official letter from the Minister of Public Works, desiring me to convey the thanks of the Government to Lord Lindsay. . . . I hope to see Lord Lindsay in Egypt on his way home. Mrs. Gill is at Cannes. . . .

With kind regards to Lord Crawford and all the family, I remain.—Sincerely yours,

DAV. GILL, Jr.

Gill telegraphed from Aden to his wife at Cannes to join him in Alexandria. Having completed his observations at Aden and Suez he reached Alexandria and mounted his altazimuth on the roof of the hotel where he and his wife lived. Mr. Gibbs of the Eastern Telegraph Company assisted them. Then they went to Cairo and became the guests of the Khedive Ismail. Finally, they took up their abode in an untenanted house which the Khedive furnished for them, at the Pyramids—what has since become the Mena Hotel. Among the scientific friends who visited them were Dr. Döllén of Pulkowa, Professor and Mrs. Watson of Ann Arbor, U.S.A., and Colonel Sir Charles Moore Watson, R.E.,

K.C.M.G., C.B., the friend and lieutenant of General Gordon. Without Professor Watson's help he could hardly have succeeded in measuring the base, so untrustworthy did he find his Arab engineer assistants. The work was satisfactorily done, and the two astronomers then set to work on an accurate measurement of the pyramid base, clearing out all the sand from the corner-stones.

Mr. Flinders Petrie, in speaking of measurements at the Pyramids, tell us ¹—

Mr. Gill—now Astronomer Royal at the Cape—when engaged in Egypt in the Transit Expedition of 1874, made the next step, by beginning a survey of the Great Pyramid base, in true geodetic style. This far surpassed all previous work in its accuracy, and was a noble result of the three days' labour that he and Professor Watson were able to spare for it. When I was engaged in reducing the triangulation for Mr. Gill in 1879, he impressed on me the need of completing it if I could, by continuing it round the whole pyramid, as two of the corners were only just reached by it without any check.

Unfortunately, in the course of Egypt's troubles later on, the MSS. relating to the base line, which were in General Stone's care at Cairo, seem to have got lost; Major Lyons, R.E., F.R.S., too, informs us that the Arabs at Gizeh destroyed all the landmarks left by Gill and chipped out the engraved metal plates which marked the extremities of the measured base.

Lord Lindsay paid the Gills a visit on his way through to his parents at Florence, and after the work was finished further matters of scientific interest arose at the initiative of General Stone and the Khedive. Before speaking of them it may be right to insert here a summary of what he accomplished during his residence with his wife among the Arabs at Gizeh. This is compactly put,

¹ *Pyramids and Temples of Gizeh*, 1883, p. 2. See also further details about this survey at pp. 205-7 of the same book by Mr. Flinders Petrie.

in a final letter to Lord Lindsay before embarking at Suez for England.

TO LORD LINDSAY (at Florence)

CAIRO, *May 14, 1875.*

DEAR LORD LINDSAY,—

* * * * *

I have not much time to write for I only finished work late last night and have everything to prepare to start for Suez to-morrow with a special train to catch the steamer.

I defer a full account of the work done till we meet, but I have measured a very very accurate kilometre, established the latitude and longitude of the Great Pyramid, and measured the sides and height of the Great Pyramid to ± 1 millim., and their exact azimuths by a triangulation.

Döllen and I began a determination of the deviation of the plumb line by the Great Pyramid, but poor Döllen was seized with a return of hæmmorrhage of the lung and compelled to go, with his instrument, before we could get any result. (The true displacement is about 2".) Professor Watson of Ann Arbor has been here for the last fortnight and has helped me very much. . . .

TO PROFESSOR NEWCOMB (at Washington)

ALEXANDRIA, *February 21, 1875.*

MY DEAR NEWCOMB,—I am here in Egypt on my way home from Mauritius, and among my letters find one from Grubb of Dublin which is the immediate cause of my writing to you.

He tells me that you have been making the round of the European optical workshops in quest of a maker for the great telescope of the new Californian observatory. He asks me to write you and tell you my opinion of himself as a mechanic and an optician. . . .

The Transit is over. We lost first contact at Mauritius but got a very fine lot of photographs, some good Heliometer measures and some double image measures of Venus' diameter.

* * * * *

In November I got a fine set of determinations of the diurnal parallax of Juno which I believe will give a very excellent result of the Solar Parallax.

* * * * *

Always sincerely yrs.,

DAV. GILL, Jr.

While Gill was carrying on his measurements at or near Cairo, from February to May 15, General Stone, who was the Khedive's adviser, recommended an accurate survey of Egypt; and the Khedive invited Gill to carry it out in one or other of two ways. (1) To sever the connexion with Lord Lindsay and to enter the Khedive's service as Director of Surveys, (2) To direct the survey from Dun Echt, paying a visit every year to Egypt.

At this time Lord Lindsay, in poor health, was resting with his father and mother at the Villa Palmieri in Florence. Gill sent on to him the proposals of the Khedive, asking if there would be any objection to his going to Egypt every year for a couple of months.

Lord Lindsay clearly saw that this would not work, but both he and Lord Crawford wrote on March 19 earnestly supporting the proposal that Gill should take up permanently the influential and honourable appointment offered to him. They thought not only that the position would be the best possible opening for him, to a far greater career than he could hope for as Lord Lindsay's assistant, but also after having worked so well together in completing the great Transit of Venus Expedition, this would be a suitable occasion for a change; and, if Lord Lindsay and Lord Crawford were now to object to losing his assistance, they felt that they would be incurring an obligation, in honour if not in law, to continue the existing relationship indefinitely, even should they themselves wish at any future time to alter the mode of carrying on the observatory.

Gill saw the importance of the views put before

him, both by Lord Lindsay and Lord Crawford, and eventually wrote to say that, if the Khedive would show good cause, he would accept the appointment. On May 14, however, a letter to Lord Lindsay shows that the Khedive had ended the matter differently. There already existed in Cairo an Astronomer and also a Professor of Geodesy. These Egyptians became alarmed at the proposals made to Gill, and

moved heaven and earth to persuade the Viceroy that the existing maps were for the present good enough, that Egypt should be surveyed by Egyptians not by foreigners, etc., etc., and finally upset all General Stone's plans.

So it fell out that it was the Khedive, in fact, who first put it into the heads of Lord Crawford, Lord Lindsay and Mr. Gill, that their existing relationship might not necessarily be permanent. There was indeed already a vast change in their relative positions. Gill was no longer the young amateur hoping for some opportunity to leave a commercial career for astronomy. He had already become an astronomical observer and organizer, with a scientific reputation, living in close intimacy and continuous correspondence with many of the greatest living astronomers. Struve and Döllén, Foerster, Vogel and Auwers, Backhuysen and Oudemans were in frequent correspondence with him, as well as Newcomb, Airy, Adams, Stokes, Huggins, and many others. The proposals for the Mauritius expedition, and for getting the sun's distance from observations on Juno by heliometer—these had been published as common property with Lord Lindsay. But it was Gill himself who, by the results already attained, had proved himself an incomparable observer, with an instinct in the use of instruments and a perfect genius for the combining of check observations for the elimination of systematic error. These qualities were known to his correspondents and had now raised him to a high rank among practical astronomers.

He may not himself have been fully conscious of all this, but he was very conscious of the extent to which any advance he had made was due to his position as Lord Lindsay's assistant.

On his return to Dun Echt the little house built for him beside the observatory often received distinguished visitors. Lady Crawford (Lord Lindsay's mother), however, when the house was built (to establish a Director or assistant on a very modest salary to carry on observations under Lord Lindsay's direction) had never intended that such an assistant should be a man of great reputation, receiving visitors whose equipages would have to be put up in her stables. She had never thought that in building the observatory house, they were establishing a gentleman's villa in the very middle of their park.

Her view was perhaps a not unnatural one, and accordingly Lady Crawford resolved to revert to her original intentions, and to cut down the amenities which had arisen round the residence, and also to give a part of the Gills' house to Mr. Carpenter, Gill's assistant, and his wife.

However sound this judgment may have been as to the position to be occupied by the Director of Lord Lindsay's Observatory, it could not be very satisfactory either to Lord Lindsay or to Mr. Gill. The position, in fact, became intolerable.

Meanwhile, it was becoming very difficult for Gill to do no more than act solely in carrying out the orders of his chief, and for Lord Lindsay to feel justified in limiting Gill's energies to his own conceptions about the work of his observatory. Then the situation created by Lady Crawford's objections was well considered and the two friends decided to part, with undiminished friendship and esteem on both sides.

There never had been, in the history of astronomy, a more successful partnership, or one so entirely devoid of friction; or one in which each party was so absolutely

loyal to the other, with an ever-growing affectionate friendship. And Gill never in his life forgot his debt to Lord Lindsay for rescuing him from a tradesman's career. But after the most careful consideration they agreed it was best that Lord Crawford should determine the agreement of December 1871, by giving notice of six months and paying the sum stipulated in their original bond. This was in November 1875, but Gill carried on the work beyond the six months.

Had this most wise decision been avoided it would have become inevitable either that Lord Lindsay should lose control of his own observatory, or that Gill would be unable to make the most of such talents as he possessed for the advancement of astronomy.

The writer was fortunate enough to visit the happy home of the Gills at Dun Echt, had the great pleasure of Lord Lindsay's acquaintance, learnt from each of them the respect and affection in which he held the other; has read all the existing letters between them, and has been told by Gill himself of the way in which their partnership came to an end; and he would like to express his admiration of the unselfish loyalty and sympathy of each of these men to the other not only during the years while they worked together, but throughout life. At the same time he has now the opportunity of testifying to the debt that astronomy owes to Lord Lindsay for his prophetic insight when he transformed David Gill from a watchmaker into an astronomer.

When James Ludovic Lindsay, the twenty-sixth Earl of Crawford, and Earl of Balcarres, died on January 31, 1913, Sir David Gill wrote an excellent biography of his old chief, which appeared in *Nature* on February 13, in which, after enumerating his scientific works, he says—

He had an inborn genius for mechanics and engineering, a love of science in every form, and a passion for travel; and inherited from his father the love of all things rare

and beautiful, together with the instinct of the antiquarian, the bibliophile and the collector. His generous and sympathetic nature endeared him to all who were his fellow workers, and more than one man has to thank him for scientific opportunity that would have otherwise have been denied him.

CHAPTER VIII

INTERREGNUM—MARS EXPEDITION TO ASCENSION (1876-8)

Last days at Dun Echt—Sir George Airy—Ascension expedition—
A catastrophe—Anxieties—Success—Mars Bay—Mrs. Gill.

THE last year of the Gills' residence at Dun Echt (1875-6) was a year of great happiness in many ways. The astronomical work was largely computation of results obtained at Mauritius, and further checking and measuring the minute instrumental errors which inevitably attend the finest constructions by human hands. Outside of this work there was much to brighten Gill's life. The considerable reputation he had made as an observer, and as a planner of new and more accurate methods for attacking astronomical problems, had brought him into consultation with some of the greatest intellects of the day. His experiences abroad had widened his outlook beyond the boundaries of his own parish. At the same time his personal friends in Scotland, while recognizing the success which had attended his perseverance and industry, were delighted to find that there was no change in the genial cordiality of his interest in the occupations of his friends. Thus his artistic friends, in sculpture, painting and music, rallied to his house for those intellectual and æsthetic symposiums for which his home was then and afterwards famous. John Brodie, Sir George Reid and his brother Archie, Robertson Smith and many others, found their way out to the observatory house.

Sir George Reid's letters to him at this time were nearly always illustrated by quaint designs, and show his great appreciation equally of the astronomer and the man. To Gill he exposed a humorous side of his nature almost unknown to his other associates. Those who have read Mr. John Kerr's charming *Memories Grave and Gay* will recall his notes in Chapter XIX of the little club of artists and literati, including David Gill, who used to meet at this time, as a club, in the old manse of Deer.

It was at this time, too, that his brother Jem came home from Australia for a holiday. This was the last time that these two were to meet in this world; and it remained a constant pleasure to both of them, thereafter, to recall the happy days they spent together in their old occupations of rifle-shooting and cup-hunting at the various wapinschaws; besides the more trivial amusements of social parties and dancing, in which the two brothers took a great delight.

In the early summer of 1876 Sir George Airy paid one of his much enjoyed visits with his daughters to Scotland, this time to the far north and the Orkneys. In his autobiography reference is made to the visit he then paid to Mr. Webster, M.P. for Aberdeen.¹ Here once more he met David Gill and learnt more about his work and occupations. At the date referred to, Airy was recognized, even by those Directors of Observatories who had differences with him, as occupying unchallenged the very first place in the world as Astronomer and Director of a National Observatory. Adams and others might have attained his level in astronomical research. Otto Struve's method for conducting an observatory might be preferred by some to his own. But the fact remained that he was the first man of the day in the astronomical world. His mathematical methods were looked upon by some of the Cambridge pioneers as clumsy, but they were infallible so far as they went. The orderly habit of mind which

¹ Sir G. B. Airy's *Autobiography*, p. 318.

was based on geometry governed the methods and system in astronomical reductions with which his name is always associated, as well as the strictness of rules in the conduct of his observatory about which some of his foreign visitors told amusing tales. The same geometrically exact turn of mind governed his designs for astronomical instruments. He was a born engineer, and it was he who first took the construction of equatoreal and transit-circle mountings out of the hands of the optician and maker of surveying instruments, and entrusted them to the great firms of mechanical engineers. Add to this the strict sense of duty towards his science, his country, and the Admiralty in whose employment he was, and we have a fair notion of this stern, unbending Astronomer Royal, who for so many years maintained the reputation of Greenwich Observatory as the most fertile home of accurate astronomy of position in existence.

It must not be forgotten, however, that Sir George Biddell Airy had a very human side. His great reserve could not conceal from his intimates the depth of his domestic affections. Although to the scientific world his sterner qualities alone were apparent, his intimate friends derived infinite pleasure from his genial interest in themselves, his love of nature, of historical enquiries, of humorous anecdote, of literature and of music.¹

David Gill possessed a very strong bump of veneration, and was much influenced by the character of the Astronomer Royal. Airy, on his part, had followed Gill's progress with great attention, and had the very highest opinion of his capabilities as an observer.

During his visit to Mr. Webster in Aberdeen, the Gills and Airys were lunching with a dear old friend of Gill's, Mr. John F. White, of Bridge of Don, and Airy asked

¹ One of the writer's most distinct recollections of visits by the Airy family to his father at Pitlochrie was the Irish devilry with which the Astronomer Royal joined in when his daughter sang the "Shan Van Vocht."

Mrs. Gill about their departure from Dun Echt, and what work her husband would be engaged upon. She spoke of the computations he had to make in connection with the solar parallax and his observations on the minor planet Juno. To this Airy replied, "We cannot afford to allow your husband to be without a telescope."

Thus it happened (as shown by existing letters) that when David Gill decided to part from Lord Lindsay, and there seemed to be no place in the world for him to fill at the moment, the two men upon whom he relied for guidance were Airy at Greenwich and Auwers at Berlin. Both of these men responded sympathetically. One suggestion of his own was that he should spend at least a year or two in Germany studying the language and increasing the range of his mathematics. He also considered, among other plans, the wisdom of joining Mr. Howard Grubb as a partner in his manufacturing business. The plan went so far as to specify the terms of partnership. Auwers made inquiries also as to the possibility of finding an astronomical position for him in Germany or at Pulkowa. But it was Airy who, in his quiet, undemonstrative way, took the young astronomer under his wing with increasing appreciation of his qualities, until he even went so far as to consult him on his own work when a sound judgment was required.

Not very long after Airy's remark to Mrs. Gill at the Aberdeen luncheon, he found occasion to show his appreciation in a practical manner. Gill's correspondence shows that, immediately after the 4-inch heliometer had first reached Dun Echt, and after using it for a few nights, he wrote to Mr. Cooper Key saying that his results were so extremely accurate that with the heliometer he believed he could determine the solar parallax from observations of Mars, at its nearest approach to the earth, by Airy's method, better than from observations of the transit of Venus. It is true that after his experience with Juno he came to the conclusion that far more accurate work

could be done with one of those minor planets of small diameter, which are shown in the telescope as mere points of light, than with a larger and nearer planet, like Mars, showing a disc of sensible size, affected by phase. But in the year 1877 Mars would be nearer to us than for the next hundred years, and he wanted to do the very best that could be done with that planet.

In the latter part of 1876 the Gills migrated to London, and Gill looked about for the means to accomplish his object by a voyage to the Isle of Ascension. First, he applied to Lord Lindsay for the loan of his heliometer. He, as soon as he had given up all idea of doing the same thing himself, at Madeira or Teneriffe, freely lent the instrument, saying, "There is no one to whom I would sooner lend it than to you"; and eventually insisted also upon Gill's carrying off his chronograph too.

This being arranged, there was only the question of funds to be considered. It was now that Sir George Airy first used his powerful influence on Gill's behalf,¹ and, largely at his instance, the Royal Astronomical Society made an application to the Royal Society to devote to this purpose some of the funds administered by the Government Grant Committee. This was refused, and then the R.A.S. gave £250 out of their own funds and raised another £250 by subscription, Airy himself being one of the subscribers. Gill never in his life forgot this act of the R.A.S. It led him ever after to devote himself, whenever possible, to the society's interests.

This difficulty being overcome, astronomers felt confident that the success of the Ascension expedition was assured, in the hands of the man who had already proved what he could do single-handed in adverse circumstances.

The friends who principally had used their influence in this matter were Lord Lindsay, Airy, Adams, Hind

¹ Sir G. B. Airy's *Autobiography*, 1877. "In April of this year I was much engaged on the subject of Mr. Gill's expedition to Ascension to observe for the determination of the parallax of Mars at the approaching opposition of that planet," p. 318.

and Huggins (who was then Pres. R.A.S.). All of their friends who knew anything about life on the Isle of Ascension were lost in admiration of his bright and charming young wife, who was determined to share his discomforts.

At the time of their departure Mr. Howard Grubb wrote—

We are delighted to hear that you and yours are well, at all events, and trust you may continue so. Certainly you have a brave wife to go to such places with you. May [Mrs. Grubb] is beginning to think that some wives besides herself care for their husbands.

A fortnight before the start upon this expedition, the heliometer was at the rooms of the R.A.S. at Burlington House. Gill was erecting it there and an accident happened which nearly ruined the whole plan.

Through the kindness of Mr. W. H. Wesley, the highly respected assistant secretary of the R.A.S., who was present at the time, the following account of what he saw can now be told¹ in his own words.

It was, I think, in April of 1877—I have no record of the exact date; the heliometer which Lord Lindsay had lent for the expedition to Ascension had been brought to the Society's rooms where Gill was setting it up. He had to see that everything was in perfect order before it left England, and he proposed to show and explain it at the next meeting of the Society, so it was being mounted in the meeting-room. He had been at work at it for a day or two, and all was ready and in order, when he thought he would adjust the polar axis to the latitude of Ascension: this being near the Equator, the axis had to be lowered till it approached the horizontal. I had been with him most of the time he was at work, but had left him for a few minutes and gone into my office; I heard a loud crash in the meeting-room and ran to see the cause. There stood the iron pillar, but the instru-

¹ Sir David's own account of the accident is in his *History, etc.*, p. xxxii; Mrs. Gill's in her book *Six Months in Ascension*, p. 11.

ment, no longer upon it, lay, with the object-glass end leaning against the meeting-room table, and the eye-end, with its elaborate arrangement of tubes, etc., driven through the floor. The instrument was supposed to be a "universal" equatoreal, and Gill had been turning the screw to lower the axis, when the screw gave out—not being sufficiently long—and the whole complicated mass of apparatus was flung violently to the floor.

And there—upon the front seat of the meeting-room—sat Gill, his face buried in his hands, down which blood was trickling, as he had made an ineffectual clutch at the falling mass. He said something about everything being ruined—himself—the instrument—the expedition. It was painful to see a strong man so completely broken down. But it only lasted a minute or so: he suddenly got up and said, "Let us see what can be done." He instantly began his examination of the wreck, and asked me to go to Lord Lindsay and tell him of the accident. When I got back Gill had determined the extent of the damage, and decided upon the course to be taken. The vital portion of the instrument, the divided object-glass, had fortunately escaped injury, having been protected by the metal cap, which struck the meeting-room table, leaving a deep dent which is to be seen to this day. The eye-pieces with their tubes were ruined, but Gill would see Simms about them at once, and get them renewed. As we know, everything was done in time, and the expedition was an entire success.

In Gill's young days the most urgent astronomical problem was to measure as exactly as possible the sun's distance from the earth. At that time it was known to lie between ninety and ninety-six millions of miles. Astronomers required to know it within a thousandth of its amount. The distance of the sun from the earth, or of Mars, or of a minor planet, had to be measured accurately. The question, then, was: "who would be capable of doing it?"

Gill set this before himself as his first duty to science, to give all his energies to helping in a solution of that problem, and a considerable correspondence between

him and Sir George Airy on this subject, from January 8, 1876, onwards, testifies to their mutual regard.

On February 24, 1876, Airy says he has no intention of equipping a Mars expedition, but will rely upon the large equatorials at fixed observatories for measuring the displacement of Mars caused by the earth's diurnal rotation; and he will be glad to examine any scheme of Gill's for using a heliometer.

Meanwhile Gill, after corresponding with Auwers, hopes to use the opposition of the minor planet Melpomene, and perhaps Ariadne, at the same time as Mars. On March 6, 1876, Airy writes approvingly, at the same time saying, "I do not like *small* planets."

There are many letters indicating the moral support he was giving to Gill's Ascension expedition. He also undertook to have the Mars and Melpomene comparison stars observed at Greenwich.¹

While Gill was at work observing at Ascension he received several letters from Airy, from which extracts may here be made—

The sight of the ruddy blaze of Mars last evening reminded me of your enterprise and position, and made me desire to hear how you are going on, and how Mrs. Gill approves of astronomy and society in Ascension.

I have not much to communicate on the transactions in this country. There has been some uncomfortable quarrelling in the Astronomical Society.

1877, November 6.

* * * * *

1. I agree with you in inexpressible contempt for Meteorology. The reason of its attracting importance is, that it requires no capital, of money, instruments, or intellect.

¹ Sir G. B. Airy's *Autobiography*. "1878. It may be here mentioned that an extensive series of observations was made, during the autumn, of about seventy stars, at the request of Mr. Gill, for comparison with Mars, Ariadne and Melpomene," p. 322.

2. Most satisfactory is your report of work done, the 32 + 25 observations; I should think they would leave very little doubt on the parallax.

3. I beg you to convey to Mrs. Gill the expression of my sincere and cordial respect, and my acknowledgment of the share which she has taken in this enterprise.

4. About the possible sending to you an Altazimuth. . . .

5. I hope that Melpomene will come off well. I look upon her as my planet, for the following reason which you will not find in books. On 1839, June 24, I lost my noble boy Arthur. On 1851, June 24, I lost my dear daughter Elizabeth. And, while feeling that day of sorrow, I learnt on that day a planet was discovered, which I was requested to name. So I fixed on the name of the muse of sadness. The Melpomene stars will soon come into observation.

* * * * *

After the above charming extract it may be well here to forestall events, and to insert extracts from letters written in 1878, testifying to the confidence in Gill's unbiassed judgment, which Airy had already acquired.

FROM SIR GEORGE AIRY

1878, February 11.

MY DEAR SIR,—You know our anxieties about the proper interpretations of the eye-observations of the Transit of Venus. Captain Tupman has informed me that he thinks that you would not be unwilling to aid us with your independent judgment on that interpretation, more especially as applying to what may have been conceived as true internal contact.

I should be very much obliged if you could assist us in the way suggested. . . .—I am, my dear sir, Yours very truly,

G. B. AIRY.

The investigation was duly made and reported upon. Then finally, on March 4, 1878, Airy writes to Gill—

Your contribution to the discussion of the observations of the Transit of Venus is invaluable.

Concerning the Ascension expedition it is unnecessary to say much here, and the reader is referred to a charming popular description written at the time,¹ in which Mrs. Gill described the difficulties encountered on the inhospitable volcanic "clinker," and in their almost inaccessible encampment at "Mars Bay," with much humour and pathos. We see two beautiful lives being lived there; and the reader's sympathy is divided between the anxious observer, when the heavy and delicate instruments were being transported under dangerous conditions, or when the clouds refused for weeks to dissipate, and the wife who relieved him from attention to domestic concerns, while stifling her own anxieties concerning untoward meteorological and astronomical affairs.

On June 14 Mr. and Mrs. Gill sailed from Dartmouth. Touching only at Madeira, they reached St. Helena on July 1. Here they had to land and wait till the 10th for the *Edinburgh Castle* to take them to their destination. In exploring this island, Gill seems to have taken far more interest in the remains of Halley's Observatory than in Napoleon's tomb. The observatory was set up in the seventeenth century when Halley commanded the first scientific expedition for astronomy and terrestrial magnetism to southern latitudes. The climate here was so perfect and the skies were so cloudless, that there was a temptation to complete the work on that spot. But Ascension had been deliberately chosen on account of the weather reports, and Gill felt that he owed it to those who had financed the expedition to adhere to the programme they had approved.

So on July 13 they landed in Ascension while that island was suffering from a slight attack of "rollers," that unexplained affection of the ocean in those parts which caused them some trouble later on. There was

¹ *Six Months in Ascension*, by Mrs. Gill. John Murray, 1878. Any one who has not yet read this delightful book has a treat in store.

no town on the island, only a garrison. The island was styled in the Navy List, "Tender to H.M.S. *Flora*," and was run on true navy lines. Bread was baked every few days, a sheep or two were killed twice a week, no vegetables except sweet potatoes. Goat milk was generally served with the rations, except when there were many sick in hospital who needed it all. One gallon of water was allowed per day.

Captain Phillimore was very helpful, and established them in an empty cottage; and, in a very few days, by July 17, the instruments were set up without mishap. The observing books were laid out, but they remained blank for weeks. Clouds obscured Mars every night. The disappointment, the anxiety, and the responsibility grew with every night of cloud. At last it occurred to them that the clouds might be local, due to the vapour-laden trade wind passing over the hill-top to the south-east. So, one night, while Gill remained with the instruments, his wife insisted on marching with two guides and a lantern over the pathless rock for some miles, while husband and wife made simultaneous notes on the weather, every half hour from 10 p.m. to 3 a.m. Her report was favourable, and when they compared notes, there could be no doubt the clouds were local, and the instruments must be packed up again and transported to the windward side of the island. It was a grave decision.

On August 1 the dismantling process commenced, Captain Phillimore having recommended a certain cove near the south point of the island. On the 2nd a steam launch towed their gear in lighters, with Gill and Captain Phillimore, to the cove, which the Captain now christened "Mars Bay," and foundations were laid on the bleak, dusty, volcanic stones. The next day sixteen Kroomen carried overland the delicate instruments, and in three days the change had been made. It was a rough life there, for food and condensed water had to be carried

from Garrison. At first Mrs. Gill remained at Garrison, and after a few days of work the expedition again appeared to be doomed to failure, for Gill himself succumbed to over-fatigue and exposure to the sun, and was carried back suffering, as the doctor found, from slight fever and a swollen knee. Three days of rest, however, did wonders, and on August 10 he returned to Mars Bay with his wife to look after him.

Thereafter things went better, and they had the pleasure of overcoming numerous difficulties. Time had been lost, but a splendid set of morning and evening observations of Mars was secured, enough to ensure the complete success of the expedition, and a triangulation was then made by heliometer of all the comparison stars. The actual opposition of Mars occurred on September 5, 1877. This work was all done by November 9.

The opposition of Melpomene occurred on December 2, but up to that time no complete observations could be obtained, owing to bad weather, and eventually the attack upon this minor planet was abandoned.

Of course, news was immediately sent to the Royal Astronomical Society of the successful completion of the actual observations of Mars. The astronomer and his wife must have felt some elation on receiving by return mail the following friendly letter from the President (W. Huggins).

November 14, 1877.

DEAR MR. GILL,—*Scene.* Nov. 9—8.30 p.m. Burlington House.

The whole society in a roar of excitement in applause at your success!

What is this? A fellow (the Astronomer Royal) rises to say that after all the real merit of success is not wholly *yours*. There is somebody else who has a claim, it may be even prior to yours—I, as President, not only allow him to go on, but agree with him, and another *louder* roar of applause *not* to you, but to that other person. I hope it will not lead to feuds and jealousies in your tent



MR. AND MRS. GILL IN CAMP AT MARS BAY, ASCENSION, 1877.

[To face page 94.]

if I tell who it is that has come *before you* in the Society's appreciation. That courageous and enthusiastic lady who just at the moments of greatest difficulty and anxiety filled your tent with sunshine and your heart with fresh courage. . . .

WILLIAM HUGGINS.

Their explorations and discoveries on the island in the interval before sailing must be read in Mrs. Gill's most delightful book. Captain Phillimore's sister-in-law, Miss Bourdillon, was the only girl on the island. Her youthful impressions of the astronomer have remained so vivid that she was able to describe them in a letter to Lady Gill in 1915.

His keenness and enthusiasm appealed immensely to me; they were, of course, peculiarly refreshing there [at Ascension], and how delightful they were, and his most delightful sense of humour and power of enjoyment.

I suppose he had great power of adaptability; I used to wonder then at the way he seemed to get on with every one. When staying with you those several times out in the tents at Mars Bay, I used to think it so delightful how he entered into the smallest details connected with the men—your cook, and the bluejacket and Krooboy. He took such real interest in any whose lives touched yours. Do you recollect how he always read part of the Service with them on Sunday afternoon and evening?

How good and kind he must have been to me that I never was afraid of his cleverness! What fun we used to have over all the quaint situations and doings of Ascension! Some of those talks and readings out at Mars Bay are still quite vivid to my memory—and even some of the stories he amused me with. You used to read to us in the cool of the day, do you remember, and how he enjoyed it, before the evening work came on. I still feel how desolate I was when you left.

Readers of Mrs. Gill's *Six Months in Ascension* will feel that they are old friends with the bluejacket Graydon who attended them at Mars Bay. It is rather touching to read a letter he wrote to Lady Gill in 1915.

I shall never forget the many acts of kindness I received from your Ladyship and Sir David. . . . I have been out of the Navy on Pension nearly twenty years. . . . The happiest time of my twenty-three years service, I can sincerely state, were spent under Sir David and your Ladyship.

I have a happy recollection of my visit to the Observatory at the Cape, and Sir David personally taking me all over the vast place, and joking about the difference to poor "Mars Bay," and he was so good to me when he wished me good-bye. I will never meet his like again.

On January 9, 1878, the mail-boat arrived. On January 24 they landed in England, and were greeted by the astronomers with enthusiastic congratulations on their success. The reduction of the observations took time. They finally settled the conflicting estimates of the sun's distance; and the results were universally accepted until long after, when Gill himself improved upon them, by the observations made upon three minor planets with a more powerful heliometer at the Cape of Good Hope.

The Gold Medal of the R.A.S. was awarded to him in 1882 for this work on the Solar Parallax. In the same year, and for the same research, he was awarded the Valz Medal of the Institute of France (Acad. des Sciences).

It must not be forgotten how much of the credit was due to her who supported him through his labours. His wife has always pretended that she knows nothing about astronomy. That may be so, and yet, all of those who knew will endorse what is said in this letter from Dr. Auwers.

TO DAVID GILL FROM DR. AUWERS

BERLIN, *January 7, 1879.*

I beg to tell again, how much I have been pleased in reading Mrs. Gill's fresh and lively account of the fortunes of your expedition. I now can judge myself how right

was Sir George Airy in stating at some meeting of the R.A.S. last winter that a considerable and highly appreciable part of the success of the expedition was due to the unfatigued assistance you obtained from Mrs. Gill, and I cannot but ask her most sincerely to accept, from my part too, warm thanks of a scientific colleague for the enduring and successful share she has taken in such an important astronomical work.

The Ascension expedition benefited Gill not only by enhancing his reputation as an astronomer. He wrote to astronomers all over the world, with most of whom he was not then personally acquainted, to ask them to contribute observations of position for the comparison stars which he intended to use with Mars in his heliometer observations. This correspondence created new and lasting friendships, none greater than with E. C. Pickering of Harvard and Gould of Cordoba. In reply to Gill's letter, when the work was done, describing his experiences, Gould's letter contains the following—

Your descriptions of disappointments, new endeavours, anxieties, etc., seemed like a narrative of past scenes in my own life. When I read your letter to Mrs. Gould she exclaimed, "How this recalls our own past."

What splendid things these good wives are!

That Gill himself endorsed these sentiments is shown by an entry upon the fly-leaf of the copy of his Mars parallax Memoir which he gave to his wife. It is adapted from Carlyle's verse.

AN ISOBEL GILL

So ist das Werklein nun vollbracht
 Drum nimm's mein holdes Weiblein
 An Dich, im schreiben, hab'ich stets gedacht
 Und Es und Ich wir sind ja Dein.

DAVID GILL.

Although during his whole life Gill's energy was as remarkable at his desk as in his observatory, still there was nearly a year's work to be spent upon the reduction of his Mars observations at Ascension.

CHAPTER IX

APPOINTMENT TO CAPE OBSERVATORY (1879)

Life in London—Nasmyth—Death of his father—Radcliffe Observer—Appointment to Cape of Good Hope Observatory—Pulkowa—Airy.

DAVID GILL, after his Mars observations, had a great deal of computing to do, and, wishing to be near his astronomical friends and the library of the R.A.S., he took rooms in London, and later on he furnished a house for himself and his wife in Kensington. Here he used a bare room on the top floor, without carpet or table-cover, as a study. He took great delight in showing to his friends certain old Spanish pictures which he had acquired, on the walls of the staircase and sitting-room. These pictures were a feature of his rooms in the observatory at Cape Town, and, after his retirement, at 34 De Vere Gardens, Kensington.

The future for Mr. and Mrs. Gill was still unknown and matter for some anxiety. Borne up with this new success as an encouragement, he set to work at the duty lying before him of finishing all the computations connected with his Mars observations.

At this time the Gills widened their circle of friends in London; not only among astronomers, but among people of culture generally, both literary and artistic.

Mr. Samuel Smiles, the biographer, had long been an intimate friend, and at his house they met men distinguished in various walks of life. Here one evening took place the first meeting between David Gill and James Nasmyth. Nasmyth is best known as the inventor of

the steam hammer, but his autobiography¹ is a fascinating record of mechanical and inventive skill applied to engineering, and, after retiring from business with a fine fortune, to making astronomical telescopes with his own hands, and adding materially to our knowledge of the heavenly bodies.

It was he, in fact, who first detected the remarkable individuality of the minute components of the sun's photosphere visible only under the best atmospheric conditions, generally called Nasmyth's willow-leaves because of their shapes. His astronomical speculations, especially on the moon's constitution, were ingenious, and his mechanical skill in grinding and polishing specula very great. Nasmyth held very decided views about the true education of an engineer.²

The truth is that the eyes and the fingers—the *bare fingers*—are the two principal inlets to sound practical instruction. They are the chief sources of trustworthy knowledge as to all the materials and operations which the engineer has to deal with. No *book* knowledge can avail for that purpose. The nature and properties of the materials must come in through the finger-ends. Hence I have no faith in young engineers who are addicted to wearing gloves. Gloves, especially kid gloves, are perfect non-conductors of knowledge. This has really more to do with the efficiency of young aspirants for engineering success than most people are aware of.

Nasmyth was proud of his "workman's hand," and was in the habit of signing papers with "his mark," an ink impression of his thumb-mark. [The writer has one of them before him while he indites these words.]

The characters of Gill and Nasmyth had much in common, of mechanics, astronomy, and dogged persistence. After dinner on the evening when they first met, while they conversed upon subjects of mutual interest,

¹ *James Nasmyth, Engineer: An Autobiography*. Edited by Samuel Smiles, LL.D. London, John Murray, 1885.

² *Autobiography*, p. 95.

Nasmyth suddenly seized hold of Gill's hand, a broad, strong, flexible hand, and in his Scottish accent said, "Man, I like yer thoom !"

When the party broke up, Mr. and Mrs. Gill with James Nasmyth took the same omnibus. Nasmyth got out first. When Gill paid the conductor the latter said, "And a penny for the other gentleman; he said you would pay his fare." The Gills were amused at this.

The next day a letter arrived from Nasmyth enclosing a cheque for £1000 for Gill to spend on whatever astronomical instrument he might think he could do the best work with. Gill was full of gratitude for the welcome gift to their much-loved science, and deposited the money in the bank. As it happened, he was appointed to the Cape Observatory very soon after. So he returned the cheque that it might be applied more advantageously. Nasmyth, however, found an opportunity later to renew the offer.

During this period he also made the acquaintance of painters in London already mentioned, and had many opportunities of cultivating his great appreciation for music.

On April 6, 1878, his father died at Aberdeen, David having travelled north on account of his sudden illness. He was occupied for a month there with the business of the estate. As eldest son he became the owner of the estate of Blairythan, a farming property the rent-roll of which relieved him from any present uneasiness on his wife's account, and enabled him to devote himself all the more completely to his chosen path in life.

At the beginning of May 1878 the death of the Rev. Robert Main, Radcliffe Observer, Oxford, left a vacancy at that observatory. The most notable feature of that place at the time was its possession of a magnificent heliometer, the only one in Britain besides Lord Lindsay's. It had never been put to any useful purpose. At that date there was only one man in Britain who had

done good work with a heliometer, and his had nearly rivalled all that had ever been done elsewhere with it (even by Bessel), and this man was David Gill.

Obviously this was a post to which he could undoubtedly bring credit, and he applied for it. His friends felt equally sure about his special fitness for this post, particularly those in Russia and Germany, who themselves had practical experience with the heliometer. There is a copy of Gill's testimonials among the papers in the *Archiva Lindesiana* of Lord Crawford. Gill himself does not appear to have kept a copy. The names of his supporters¹ and their manner of stating Gill's claims ought to have borne great weight. Airy, when asked for support, quoted some rule he had which prevented his helping

Among Sir David Gill's private papers, there is a letter to him from Sir George Airy.

FROM SIR GEORGE B. AIRY

ROYAL OBSERVATORY, GREENWICH,
1878, June 10.

MY DEAR SIR,—Under various considerations I have abandoned the rule which I stated to you in reference to the position of Radcliffe Observer, and have addressed a letter to the Trustees of the Radcliffe Fund and Observatory.—I am, my dear Sir, Yours very truly, G. B. AIRY.

David Gill, Esq.

Gill had no one to push his candidature; so, in spite of his great claims as shown by testimonials and by his skill in using the heliometer, his name seems to have been put on one side.

The other candidates were Stone, Christie, Tupman and Pogson. The Trustees gave the appointment to Mr.

¹ The names of Mr. Gill's supporters were: Lord Lindsay, Professor J. Clerk Maxwell, Dr. Huggins, J. R. Hind, Dr. Ball, Rev. T. R. Robinson, Professor R. Grant, Sir William Thomson, John Hartnup, Otto Struve, Professor Döllén, Dr. Auwers, Dr. Förster, Dr. Winnecke, Dr. H. C. Vogel, Dr. J. G. Galle, Professor Bakhuyzen, Dr. Oudemans, Professor E. C. Pickering.

Stone. This left a vacancy at the Cape of Good Hope, but not immediately, for the Radcliffe Trustees allowed Mr. Stone to stay on at the Cape to conclude some valuable work on which he was then engaged. Until recently the Cape Observatory was almost the only one suitable for a study of the southern heavens. The requirements of astronomy in that direction were very great, and Gill felt it in him to do good work there for his beloved science, and applied for the post. The only other candidate was Mr. W. H. M. Christie, chief assistant at Greenwich Observatory, whose claims to the appointment were placed before the Admiralty by the Astronomer Royal.

Gill, during the anxious period of waiting, was hopeful but diffident; for he was well aware that he was a self-made astronomer, who owed nothing to outside influence; that he had not been trained under any great astronomer; that he had proved his mathematical powers to the world only to the extent required in actual work, and not by a contest in the Cambridge Tripos. But the friends who supported him knew that his reputation was established as an almost unrivalled observer, as an engineer for the design and equipment of an observatory, with remarkable organizing powers, and as an astronomer of great ability, lofty ideals, sound judgment, originality and dogged perseverance; and that astronomy needed him.

Gill was probably never aware of what he owed to his old chief, Lord Lindsay, for taking some trouble to see that in this case his testimonials should receive proper consideration. This can be learnt only by reading the private papers of Lord Lindsay, placed at the writer's disposal by the present Earl of Crawford.¹

¹ The present earl has given much help by searching out old documents for use in this biography. It is a splendid comment upon the present great European war that, when I asked, in August 1915, for further materials, Lady Crawford should, in reply to my letter, have told me that her husband would be unable for some time to attend to the matter, because "Lord Crawford is serving at the front as a private in the R.A.M.C."

It really came as a surprise, and a great joy, to the Gills when, on February 10, 1879, first from Lord Lindsay and later from the Admiralty, the news came of his appointment as Her Majesty's Astronomer at the Cape of Good Hope. Among Lord Lindsay's papers there are two almost identical holograph notes, probably sent to different addresses, from Mr. W. H. Smith, First Lord of the Admiralty, announcing the decision he had reached.

There were barely three months left for preparations before they should start for their new home. There was much to be done, and one of Gill's first acts was to write to Mr. Nasmyth returning his gift of £1000 as no longer being required. He had also to get rid of the lease of his house, and pack up his furniture and belongings. He was also anxious to establish more firmly the friendships he had made with astronomers abroad and his knowledge of their instruments before leaving for the southern hemisphere. And it was most important that he should have his Mars calculations complete before sailing.

Some notion of the affectionate esteem in which Mr. Gill was even at this date held by his scientific friends may be gathered from the remarkable contents of the following letter.

TO SIR GEORGE AIRY

36 PEMBROKE ROAD, KENSINGTON, S.W.,

1879, *March 31.*

DEAR SIR GEORGE,—I have received a very unusual and liberal offer, viz. from Mr. Newall of the loan of his 25-Inch Telescope for a period of years at the Cape, and of £1000 from Mr. James Nasmyth towards the cost of transporting and erecting the same.

Such a proposal seems to deserve and require the most careful consideration.

Of the work open for such an Instrument I need not write to you, nor need I write you on the other hand of the dangers of being over-instrumented.

After much anxious thought I have determined to ask my generous friends to allow time for the consideration

of the question. When I have discussed future work with Mr. Stone, when I have been on the spot and ascertained something of the capabilities of my staff—then I should be in a better position to judge of the wisdom of accepting the proposal.

If then I decided on accepting it I would be able to lay the matter before the Admiralty in a much more complete and practical form. In the meantime I would be greatly obliged if you would think the matter over in its various aspects, and on my return from the Continent give me your opinion about it.

I would have called at Greenwich on the subject, but I leave on Monday morning on a visit to the Continental Observatories and have many matters to arrange which keep me busily employed.

* * * * *

I am, my dear Sir George, very sincerely yours,
DAVID GILL.

Sir George Airy took a great deal of trouble about this offer, and wrote very fully when Gill returned to England. In the end it was settled to leave it over for the present, both Newall and Nasmyth allowing their generous offers to remain open for twelve months.

The tour of foreign observatories had most valuable results. He visited Paris, Leiden, Groningen, Hamburg, Copenhagen, Helsingfors, Pulkowa and Strassburg. The personal friendships which he then made or strengthened secured all the co-operation that was often necessary to him in his isolated post at the Cape. His enthusiasm, force of character, and winning personality infected the younger men he met, and made some of them ready in after years to assist in his great undertakings. At Strassburg Professor Winnecke and his senior students in astronomy — Küstner, Hartwig, Hermann Struve, Ambronn and Elkin—were all, from that time, his devoted friends. And so it was everywhere and always.

Professor Backlund supplies the following notes of Gill's visit to Pulkowa—

I remember well the impression he made on me, an impression which corresponded very nearly to the image I had formed from studying his scientific works. The remarkable clearness and energy in the expression of his scientific views did not, accordingly, surprise me.

During his short stay in Pulkowo¹ the astronomers assembled to discuss a variety of astronomical questions, the last evening. It was in the house of Döllén; he exposed to us his plans for developing the Cape Observatory into a first-class observatory, and he did that in such a manner as to fully convince us that "ille faciet."

After the conversazione he proved himself an entertaining guest at supper. The hostess—Mrs. Döllén—talked with him about Paris, where he had spent some time before arriving at Pulkowo. To her question how he beguiled the evenings there after his scientific meetings he answered that he strolled along the boulevards looking at the beautiful Parisiennes. "How would that please Mrs. Gill if she knew it?" asked Mrs. Döllén. "I strolled just for the pleasure of telling my wife what beautiful sights Paris has for the strangers," was the answer.

After seventeen years I met Gill again, this time in Paris in 1896 at the astrographic congress and at the subsequent congress of ephemerides. The seventeen years had in no way abated his energy; on the contrary, they had enhanced it, supported now by the considerable success at the Cape. He had entered the ranks of leading astronomers, and his vast views, greatness of mind, conscientiousness and acuteness in details, and enormous activity in all branches of astronomy, predestined him to sway in the dominion of astronomy. This great faculty to make his opinion prevail was renowned. In the Congress of Ephemerides there were two proposals about the value of the constant of aberration. Newcomb proposed $20''.50$, a lesser value being not compatible with his theory of the planetary motions. Gill stood out for $20''.47$, deduced from his observations at the Cape. This value, which is greater than that of Struve, $20''.44$, was accepted.²

¹ It is well understood that this spelling is considered by Dr. Backlund to be the correct one. It has been more convenient in this book generally to use the old form "Pulkowa."

² The latest result (of 1915) finally reached at Greenwich with the wonderfully accurate floating Telescope of Cookson agrees exactly with Gill's value of 1896. See M.N. of the R.A.S., 1915.

It is much to be regretted that we are not able to give in the same form the impressions of Dr. Auwers when at this time he, too, again received his friend in Berlin. But his sad death at an advanced age in 1915, on January 24, the anniversary of Sir David's death, and the circumstances attending the war initiated by Germany against Europe and the higher civilization, have closed to the biographer the storehouse of information in the possession of that great leader of astronomical work in Germany. From 1873 to 1914 Auwers and Gill worked hand in hand, knowing well that in every work undertaken to advance their science each could rely upon the other as upon a second self.

This tour of the foreign observatories had a great effect on the future of astronomical observation. It enabled Gill to picture in his own mind his ideals for the creation at the Cape of the premier observatory of the southern hemisphere. Absorbing instrumentally all that was best in Europe, with definite departures in the direction of still greater exactness; following closely, in government and control of work, the lines of Airy's methodical system in operation at Greenwich; and imitating, socially, Struve's example at Pulkowa, by uniting all the personal elements of an observatory into a happy, enthusiastic, patriarchal colony. His ultimate success in attaining these three ideals is attested by all, without exception, of those who served under him and of those who visited him at the Cape. He would have been the first to admit that much of the success accorded to him came from the friendships, among the older astronomers, which he formed in these earlier days. He was helped also by the numbers of enthusiasts, mostly young men, from all countries who desired to consolidate his friendship and to absorb more of his spirit, in many cases by working at the Cape as his disciples or collaborators.¹

¹ *e. g.* Elkin, De Sitter, Jacoby, Cookson, Auwers, McClean, Innes, Franklin-Adams.

After returning from his continental tour he had a great deal to do with Airy, who was anxious to do the best with Newall's offer, for he knew well that, as an observer with the equatoreal, Gill was as capable of doing good work as he certainly was in the accurate fundamental astronomy of position. At this time Gill made himself master of Airy's well-known methods for arranging his correspondence, which he introduced successfully at the Cape, although his natural turn of mind often left his own desk in a condition of apparently hopeless confusion.

During all these preparations he had to finish off his Mars reductions. During their conversations, the Astronomer Royal had discovered an unsuspected effect which might introduce a source of error into the results, due to atmospheric dispersion. The predominant ruddy colour of Mars might give to atmospheric refraction less effect in the case of the planet than of the comparison stars, especially with the lower altitudes. About a week before sailing Gill was able to send to Sir George Airy his final results.

TO SIR GEORGE AIRY

LONDON,
1879, *April 26.*

* * * * *

The Mars observations are discussed.

The resulting solar parallax from all observations is

$$8''.783^1$$

I have also divided the observations of each evening and each morning into two groups of greater and lesser zenith distance. The groups of greater Z.D. give $8''.786$. The groups of lesser Z.D. give $8''.780$.

It would appear, therefore, that the chromatic dispersion has exercised a very insensible influence in the result.

¹ This result was universally accepted. Gill's final attack on the problem with minor planets gave a result differing from this by only two-hundredths of a second of arc.

Before their actual departure for the Cape, Professor Piazzi Smyth sent to the Gills a long account of life at the Cape Observatory founded upon his own experiences there forty years before. This was written on eleven folio pages, in his usual quaint manner of description. It concludes with two of his clever pen-and-ink sketches of the Cape Observatory, very interesting as being about the date 1843.

When giving Mrs. Gill hints about house management there, he begins one paragraph thus—

In the way of entomology, I never saw a real disgusting *B flat*, as a musician said, except on a parcel brought to the Obs' out of Cape Town: but the lively little *F sharp* is to be kept in order by nothing but abundant washings down with soap and water; and therefore, no carpets! But there is another flat thing they call a Bushfly, a creeping flat brown affair, who in the summer contrives to get upon you in your walks, and if you do not look sharp he begins burying himself head-first into some convenient place for him between your shoulders and very inconvenient for you to get at him. Husband and wife may then be of inestimable service, for if you get hold of the body of the creature you must pull gently only, or the head will come off; and being left in your skin will make the cure rather worse than the disease.

Of reptiles, you must be forewarned of the snakes. . . . But occasionally a poisonous cobra is met with; and occasionally also a puff-adder which is worse, for it will pursue to bite, as well as bite when pursued.

It is impossible to withhold admiration, at this stage in his life, for the Aberdonian tradesman who, regardless of pecuniary interests, by his own efforts towards the attainment of his noble ideals, in the course of seven years of unremitting subordinate labour, had been placed, with the acclamation of the astronomical world, in a field of labour giving full scope to his indomitable, inexhaustible energy.

BOOK II

THE WORK OF A REAL ASTRONOMER

CHAPTER X

FRIENDSHIPS AT CAPETOWN (1879)

New friends — Mr. Trimen, F.R.S. — Sir Fred. Richards — Sir Bartle Frere — Sir George Colley — Sir Thomas Fuller — Dr. Muir — Cecil Rhodes — General Gordon — Social pleasures.

My lines are so pleasant to me, that everybody ought to come to me to catch the infection of happiness. This work is what I looked forward to for long.—CLERK MAXWELL.

IN June 1879, Gill and his wife arrived at Capetown. Never in his life did he lose the impression produced upon his mind, that lovely morning, as the fog lifted, when he first beheld the glorious view of the flat-topped Table Mountain, of the Lion's Head and Rump, with the white buildings of the town resting along the sea front, and climbing the slopes behind. His predecessor at the observatory, Mr. Stone, who was to sail for home the next day, came on board to welcome them. Soon after, they all drove a few miles out, to the observatory, a forlorn spot where they must needs make their home. Only a rough, muddy road led, at that time, from the station to the observatory. The avenue was little better than a cart track up the side of the hill; the grounds were entirely neglected, and practically in a wild state. Except for the trees planted by Lady Maclear (whose husband, Sir Thomas Maclear, had been H.M. Astronomer there), the hill was untended, the only redeeming feature being the beautiful arum lilies and other wild flowers which in their season sprang up on all sides, and helped to give an appearance of cheerfulness which was otherwise

wanting. The rooms, with furniture dismantled and prepared for sale, looked homeless and uninviting.

They lived for a week at an hotel in Cape Town. Afterwards, when settled down in their future home, they began to discover great possibilities, and hopes arose that, with care and attention, the observatory might be made a charming place of residence. It was fortunate that the temperaments both of husband and wife led them to take this outlook, and not to abandon themselves and the place to despair as their predecessors had done. Before many years they transformed this wilderness into one of the most delightful homes in South Africa.

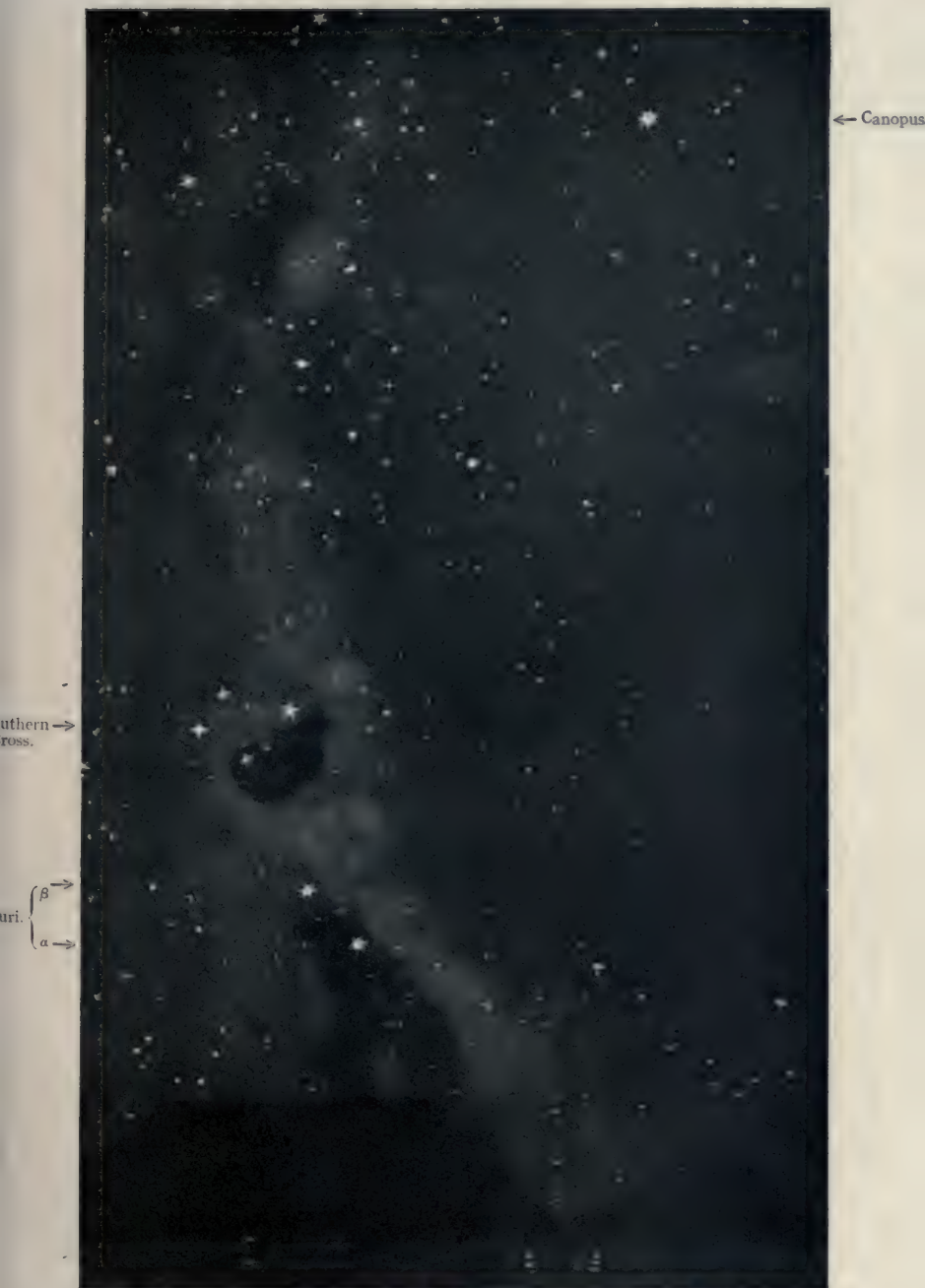
They moved into the observatory before their furniture could be put in place. They themselves had already learnt to "rough it" together at the Pyramids and in Ascension; but now early callers began to arrive, to whom tea had to be administered on packing-cases for tables, a source of great amusement to guests and hosts alike. In a week or two order was better established.

During their temporary stay at the hotel their first visitors were Miss Maclear (daughter of the old astronomer), Mr. Charles Fairbridge and Mr. Roland Trimen, F.R.S., then curator of the museum, afterwards resident in England.¹ These first visitors continued to be the dearest of friends. It is worth while saying a few words now about his relationship with the leading people when he arrived at the Cape.

The deplorable condition of the observatory grounds became a blessing in disguise, for it enlisted the sympathy of a man who became Gill's staunchest supporter and adviser in negotiations with the Admiralty, Admiral Sir Frederick Richards, known to his associates as King Dick.²

¹ Mr. Roland Trimen died July 25, 1916.

² In the crypt of St. Paul's Cathedral his marble portrait medallion in a frame of alabaster bears the following inscription: Admiral of the Fleet Sir Frederick W. Richards, G.C.B., D.C.L., First Sea Lord of the Admiralty, 1893-9. Vigilant and resolute.



[To face page 112.]

THE SOUTHERN MILKY WAY, WITH COALSACK, NEBECULA MAJOR,
AND STARS, TRULY PLACED; α AND β CENTAURI POINTING
TO SOUTHERN CROSS.

Ignorant of Admiralty methods, Gill wrote to Commodore Richards (as he then was), the Commander-in-Chief at Simons Bay, asking him to come to see the state of things and to look at his report. He came, had luncheon, looked round, bade them good-bye, and said nothing. A few days later, by invitation, the visit was returned and the Gills spent the night at Admiralty House. After dinner he showed Gill a letter he had written to the Admiralty containing important suggestions. It ended with these words: "I should be glad if your Lordships would inform me what should be my relations with the astronomer at the Cape." After two months the invitation was repeated and after dinner the Commodore put into Gill's hands the Admiralty answer approving of the suggestions for keeping the grounds. The letter ended thus—

With regard to the concluding paragraph of your letter, in which you request to be informed what should be your relations with the Astronomer at the Cape, I am instructed by my Lords to inform you that the relations between the Commodore and the astronomer have hitherto been of the most agreeable description, and their Lordships trust that they will so continue.

In relating this after his retirement, Gill added—

To the ingenious Admiralty official who penned this witty reply I beg to render my warmest congratulations on the manner in which his suggestions have been followed; for I can imagine no more kindly and helpful friends than those I found in the ten successive Commanders-in-Chief under whom I had the honour to serve during my twenty-seven years' tenure of office at the Cape.

The most important personage in the colony was the Governor, Sir Bartle Frere; and Gill's respect and admiration for him during the whole time of their

With singleness of heart and purpose he devoted his life to the Navy and to the Empire, 1833-1912.

acquaintance grew steadily with increased knowledge. Lady Frere's tact was impressed upon him forcibly at the first dinner given by her in Sir Bartle's absence, which he and Mrs. Gill attended.

As the guests assembled a telegram was handed to her, but no outward sign of its seriousness was manifest during the evening. Next morning we were told that it contained news of the death of the Prince Imperial, who had been killed in Zululand. She was doubtless aware of the effect which this event would have on the career of her husband, and yet, so perfect was her courtesy, that by no outward sign could we detect the seriousness of the situation.

Soon after, Sir Bartle returned from Natal and a public dinner celebrated the occasion, when the Gills were present. When speaking of this long afterwards, Sir David said—

A few days afterwards, photographs of the banquet appeared in the shop windows, when I observed, very much in the foreground, at the lower end of the table, an enlarged head of a gentleman with a bald spot on the back of it, which from the dress of the neighbouring ladies I soon identified as a representation of my own headpiece. Thus, much to my wife's amusement, I made the first discovery that I was bald.

This was not the only occasion on which his own idiosyncrasies were revealed to him in a way that caused him much amusement. About this time a phonograph of early type was exhibited in Adderley Street. The Gills entered the shop to examine it. Gill spoke into the instrument. When he heard the reproduction of his own voice he turned to those round him and said : " Do I r-really r-roll my R's like that ? " A burst of laughter assured him that the reproduction was accurate, and he himself joined in the merriment, utterly surprised at his discovery.

In the interview from which some of the above

quotations have been made¹ Sir David added to his recollections.

I shall never forget the impression which Sir Bartle Frere's personality made upon me. The earnestness of the man, his desire to promote everything that could conduce to the advancement of South Africa, the persistent questions he put to me as to what, from the scientific point of view, could best be done to forward its interests. He urged me to be president of the Philosophical Society, in succession to himself, and, although I at first refused on the ground that I had so much to do in organizing my new work, he came out one day personally to the observatory for the express purpose of insisting that I should take that position. Naturally, under such pressure I consented.

During the conversation just mentioned, I endeavoured to impress upon him the necessity for setting on foot a systematic triangulation of the Colony, and he, accustomed to Indian administration and knowing the value attached to accurate survey there, aided my views in every way in his power. At that time the finances of the Colony were not in a flourishing condition, and the Ministers felt that they could not at the time respond to his earnest entreaty that the work should be set on foot. But the day after Sir George Colley arrived at Cape Town to take up the Governorship of Natal, Sir Bartle Frere brought him to the observatory in order that he might talk over the possibility of starting a systematic survey in Natal. As a result of that conversation Sir George Colley promised to advocate a survey of Natal as soon as possible.

There is little doubt that Sir David Gill's estimate of Sir Bartle Frere is confirmed by the verdict of all competent critics. It was still more confirmed by what Lord Milner said to him, as he told it in *South Africa*—

I recall a specially interesting conversation with Lord Milner. It was shortly before his celebrated speech at Graaff Reinet. We were alone in the library after dinner at Government House, and were speaking together of the

¹ Majority special number of *South Africa*.

situation. I can remember now his concluding words. He said: "I have, as you know, very closely studied the history of South Africa, and whenever I come upon the footprints of Sir Bartle Frere I feel that I am on solid ground. If I fail as Sir Bartle Frere failed I should die a proud man."

Sir David goes on to say—

I have no doubt whatever that history will justify Lord Milner as it has justified Sir Bartle Frere; but it is sad to think that party feeling, prejudice, and ignorance in both cases combined, in the first place, to condemn men who deserved so well of their country, and who served it with such courage, ability and self-sacrifice.

Sir David's final tribute to Sir Bartle, in the interview quoted, is as follows—

On August 1 of that year (1880) Sir Bartle Frere was recalled. No man ever better deserved the thanks of the Government at home and of South Africans generally than did that great administrator. No man was ever more cruelly and unfairly treated. Capetown understood the services he rendered and never before and never since [this was said in 1908] has a population so fully shown by the demonstration made at his departure the depth of feeling which possessed them. Capetown, from the top of Adderley Street to the Docks, was one mass of human beings waiting in respectful silence to make their adieu to the great man who was leaving them under the cloud of the displeasure of those who did not know; to the sorrow and regret of those who did. My wife, in 1880, was unfortunately ill and had to return to England for medical advice, and I, from having so recently arrived, was unable to accompany her. Lady Frere kindly undertook to look after her by the way, and I have often heard my wife say that it was amazing that a man who had suffered so much from unworthy treatment should have spoken always so gently and charitably of all that had passed.

South Africa used then to be looked upon as "the grave of great reputations." Sir Bartle Frere's reputa-

tion has increased with the years; and many a man pauses, in admiration, before his fine statue, in the gardens between Whitehall Court and the Thames, with "India" and "Africa" emblazoned on either side. The statue was erected by public subscription in 1888.

Miss Georgina Frere has sent some notes about the relations between her father and Mr. Gill.

Between my father and him mutual esteem and regard at once sprung up and never lessened. Sir Bartle recognized in him a man after his own heart, of swift intuition and of disinterested zeal for the public service. [She adds many personal recollections of Gill as he appeared in 1879.] Nothing came amiss, and in many forms of physical exercise he found the needed relaxation from the absorption of his work. Shooting and dancing we all know remained favourite forms of enjoyment to the end of his life, and when first in South Africa I remember his also riding a great deal.

FROM SIR BARTLE FRERE

WRESSIL LODGE, WIMBLEDON COMMON,

July 24, 1883.

MY DEAR GILL,—I have sent you by *Garth Castle* a box of Books, which I shall be obliged if you will present in my name to the Philosophical Socy. I hope it continues a vigorous existence under your auspices. I constantly see evidence in the scientific Journals that the Cape Observatory keeps up its old fame—but it is long since I heard any tidings of what the Phil. Socy. are about. You will have been gratified by Trimen's F.R.S. Pray kindly congratulate him on his well deserved honours, and tell him I had often my pen in hand to write my own congratulations but the ambitious wish to write a long letter, and constant interruptions, wrecked this—like many other good intentions.

You will have been greatly grieved by Spottiswoode's¹ death. His funeral was a remarkable testimony of the widespread sorrow at his loss, felt by men of all ranks and occupations from Chancellors of Universities to compositors and errand boys, for his loss was as great to the poor of London as to the philosophers of Europe.

¹ Pres. Roy. Soc.

There is nothing comforting to write about the political world. The most accomplished, but most crotchety and mischievous in practice, of Prime Ministers goes on leading the great Liberal party from one quagmire to another—and few seem to see that the Anarchists are the only party really thriving. I wish your political aspects were more cheering in S. Africa. It will be something if you can tell us you are yourself well, and Mrs. Gill really in better health than when she left us. Give her kindest regards from us all, and believe me, my dear Gill, ever very sincerely yours,
H. B. S. FRERE.

On October 1, 1879, Gill made a report to Sir Bartle Frere on the Trigonometrical Survey of South African colonies, which was printed officially. It lays down general principles of great value by which a general triangulation should at the same time become the basis of a map for co-ordinating all local surveys made for fixing boundaries, and also assist the scientific needs of geodesy for determining the size and figure of the earth by the measurement of a long arc of meridian. The practical suggestions are of the utmost value.

Gill submitted the scheme to Sir George Airy as the most competent critic among his friends. He replied on December 7, 1879—

I approve entirely of your general plan and am certain that, so far as it is connected with territorial survey, it is the only one that can meet all wants. . . . There is ten years' work cut out for you.

Gill's reputation as an astronomer had preceded him, and when the leading men there discovered that he was prepared to occupy himself with their interests as well as his own professional ones, he immediately came to be recognized as the man to be consulted, not only upon all scientific matters, but also on all questions where a sound judgment was wanted for the good of the community. He was seized upon to help the museum and the Philosophical Society while he was pushing his plans

of survey. So also he was drawn into the vortex of education, and came in contact with Mr. Thomas Fuller,¹ who had been mainly responsible for the foundation of the Cape University, and who insisted on the formation of a physical laboratory. It was he who selected the successor to Sir Langham Dale as Superintendent-General of Education; but his choice was influenced by the advice of Gill, who has left the following reminiscences—

I remember being consulted by Mr. Merriman about the appointment of a successor to Sir Langham Dale, and I strongly recommended that a Scotsman should be appointed, on the ground that the Scottish system of education is the one best suited to South Africa, and because I thought that I knew men who would be ready and willing to give their advice in making a wise choice. Mr. Thomas Fuller went home with instructions to make the necessary enquiries, and I furnished him with a letter of introduction to Lord MacLaren, one of the judges in Edinburgh, to whom I wrote, telling him of Mr. Fuller's mission, and suggesting that perhaps he could arrange that Mr. Fuller should meet Lord Kelvin and Professor Chrystal, of Edinburgh, in consultation on the subject. They all met at Lord MacLaren's house, and their unanimous opinion was that of all men Dr. Muir, of the High School of Glasgow, was beyond doubt the best man obtainable. Mr. Rhodes, before making the appointment, interviewed Dr. Muir, and the result was Dr. Muir's selection.

This proved to be a wise choice, and Sir David Gill added—

to that appointment also, and the society of Dr. Muir, I, for my part, owe many of the pleasantest hours of my life at the Cape.

It was characteristic of the man, and, doubtless, had not a little to do with his increasing influence, that in

¹ Afterwards Sir Thomas Fuller, Agent-General for the Cape of Good Hope.

these matters he had a lively appreciation of witty and humorous incidents. He tells us—

In those days the Education Department was under Sir Langham Dale, who was afterwards assisted by Mr. Donald Ross. In his zeal the latter published a series of answers to questions in examinations, some of which stick to me still as good stories. At an elementary teachers' examination, for example, the question asked was, "State what you know about gravity"; to which the answer was, "Gravity is, if you go to the top of a hill and jump up, you will come down again. If it was not for gravity you would never come down again. We ought to be very thankful that there is gravity."

Another question I remember was: "State what you know about the connexion between electricity and lightning." The answer was, "Lightning is sometimes several miles long, but electricity is never more than two or three inches long." Another question was: "What place should music occupy in the curriculum of a school?" The answer was, "Music should be placed in the middle of the room, and taught at eleven o'clock on Wednesdays."

I remember that when Sir Langham Dale came to see this portion of the Blue-book he was not entirely pleased, and Mr. Donald Ross had a bad quarter of an hour.

Gill's attitude towards the great surveying operations with which he has enriched the world is characteristic of all his progresses in astronomical achievement. He had the consciousness of a power in him to accomplish great things. He felt that this gave him the right to demand all possible assistance to that end. And he was full of the indomitable energy which compelled support to his projects.

Thus it was that at the very commencement of his Cape career he had the active support, in his preliminary operations, of Sir Bartle Frere, Sir George Colley, and Sir Frederick Richards, followed later by that of Lord Milner, Cecil Rhodes, Earl Grey, Sir Charles Mitchell,

Lord Loch, and all the admirals who ever commanded at the Cape station.

A determined man, too, is, more often than not, favoured by what we call luck. It could hardly be foretold or expected at that date that Gill would ever see the Orange Free State, the Transvaal and the extensive tracts of Rhodesia as integral parts of the British Empire through which the measurements for his great arc of meridian should pass towards his goal on the Mediterranean, or that its course in the north would be assisted by the hostility of the Mahdi giving into our hands the Upper Nile and Lake territories. Through these events his original aspirations developed into expectations; and the measured great meridian arc, on 30° east longitude, became, as he told us, "the dream of my life."¹

While Gill's highest pleasure arose from doing these things himself, he also derived great delight in later life in recounting the valuable assistance he received from many friends, and also from the officials at the Admiralty, who soon discovered that when Gill wanted a thing done there was always a very good reason for it. There was no one to whom he was more indebted in this way than Sir Frederick Richards, who in 1898 became Admiral of the Fleet. His first indebtedness has been mentioned, his second is told thus—

In October 1880 I visited Natal as the guest of Comodore Richards on his flagship *Boadicea*, in order to make preliminary experiments connected with the telegraphic longitude of Aden and Cape Town, and to further discuss with Sir George Colley the steps to be taken in connexion with the proposed survey. The result was that Sir George Colley took immediate steps to forward the project by addressing a message to the Legislative Council proposing to place a sum of £2000 on the Estimate of 1881, for the initial expense of the proposed operation. One of the last documents addressed by

¹ Presidential address, Brit. Assoc., 1907.

Sir George to the Council was a message of thanks regarding the above proposal, dated December 21, 1880. A few days afterwards he left his seat of Government, never, alas! to return.

I remember the journey from Durban to Pietermaritzburg. The line was then completed only to Pinetown, where we found a transport mule-wagon to convey us over the remaining fifty-five miles of our journey. On driving into the avenue of Government House, Maritzburg, covered with dust from our journey, we found to our horror the lawn in front filled by guests at an afternoon party there. "'Bout ship," said Sir Frederick Richards. But it was impossible to "'Bout ship," so we drove right past Government House, through the guests and away to our hotel, where we might hide our filthy heads, and undergo "alterations and repairs." We spent a quiet evening at our hotel, and turned up next day at Government House in more presentable condition. On the last evening of our stay, there was a large official dinner party at Government House. A few weeks later nearly half of those at table were killed [at Majuba Hill] during the first Boer war.

It may be as well to introduce among these memories Gill's impressions of Cecil Rhodes as given in later years.

I remember a good many years ago calling upon him in his office one day to ask whether he would be disposed to undertake the extension of the Geodetic Survey of South Africa through Rhodesia. I pointed out to him not only the desirability of starting a systematic survey at an early stage in the history of the development of his new country, but also the great scientific problem for the measurement of the earth to which a notable contribution might be made by extending a chain of triangulation from the Cape to Cairo. I explained that it would be an invaluable contribution not only to geodesy, but to geography, and would form a point of departure for connecting together all the surveys of travellers of the territories through which that chain would pass, and might incidentally serve also as an aid to the survey of the great railway scheme which had then started. Mr. Rhodes said to me, "Yes, that is a fine scheme—a fine scheme; but you must remember that I must first of all

provide something in the way of roads and bridges to facilitate communication, and when we have got so far in that direction I will support your survey." Then, turning to a map of Africa, he said, "Look here, a man requires two things to enable him to do great work in the world; these are, first imagination, and next grit. The French have got imagination, but we have mostly the grit without the imagination. Now look at the French what they are doing. They have got some possessions here on the West Coast of Africa, and they have got a little spot here on the border of the Red Sea, and they have got a man¹ just now going from west to east, and I have got an eye upon him, and our grit will stop him getting there. To those who have got imagination and grit everything will come. Now, good-bye, I won't forget my promise."

He did not forget his promise. It was largely owing to him that, when Sir David Gill died, the completion of work on the great arc of meridian was almost within sight. While Lord Grey was administrator of Rhodesia things went on well. When he left, Gill met with difficulties in getting over which he had further insight into the methods of Cecil Rhodes. When he called and explained to him his difficulties, Rhodes turned to his secretary, saying, "Take a telegraph form and write: *I have promised Sir David Gill that I will carry out his Arc of Meridian.* Tell them to find the money. The rest is all red tape."

After that, Rhodes turned to Gill and said, "Fine thing, money." Gill replied, "Finer thing, astronomy," to which Rhodes answered, "Too d——d expensive."

There was something of dogged persistence in Rhodes' character which appealed to David Gill; he often visited the great man at Groote Schuur, and has told many things about his character. He said—

One of the most delightful things about him was his joy and delight in the beauty of his surroundings. He

¹ [Colonel Marchand.]

would sit under his verandah at teatime looking upon the great mountain before him, and ask you passionately : " Is there anything more beautiful in the whole world ? "

He would turn upon you suddenly and say, " Did you ever realize what a privilege it is to be an Englishman ? " And, if I mildly suggested that it was better to be a Scotsman, he would say, " Ah, man, that is the same thing."

David Gill's humility, devotion to duty and purity of mind are shown in his correspondence by the admiration he bestowed upon all the men possessed of these qualities who crossed his path. Among those who were resident at the Cape in those first years there was none who could excite this spirit of admiration more than General Gordon. He accepted the command of the colonial forces in South Africa in 1882; and resigned when his negotiations with Masupha, the Basuto chief, were interrupted by the unfair attack instigated by Mr. Sauer, secretary for native affairs in 1882.

" Chinese " Gordon used frequently to turn up at the observatory for a talk with David Gill in his study, that fine large room where visitors were received by him and where he did his work and correspondence. On one occasion " the wifey " was sent off to fetch a Bible and *Paradise Lost* to enable Gordon to give a proof to Gill that he could locate geographically the site of the Garden of Eden, illustrated by rough pencil sketches which still exist.

These two men had a sincere regard for each other, and when Gordon came to the observatory to say good-bye before leaving the Cape, Gill accompanied him across the little grass triangle in front of their door to give him a last handgrip. Then, as the hansom drove off, General Gordon turned to George Kilgour (a kinsman of Mrs. Gill's, who told her afterwards), saying quietly, as he jerked his thumb towards Gill, " Of such is the salt of the earth."

In the first year of their life at the Cape the Gills firmly established themselves in the affections of their own settlement in the observatory and also with the people of Cape Town. Mrs. Gill's friendliness, dignity and fun captivated the hearts of the colony, and although Mr. Gill was a perfect glutton for astronomical work, he held that "an astronomer is to be reckoned not merely a man of science, but, more or less, a gregarious human being." He was not averse from helping other human beings to enjoy our glorious world. When leaving England to take up his duties at the Cape, the Astronomer Royal's last words were, "Promise me, Gill, not to become a dress-coat astronomer." Whether or no the advice was needed, he followed it, for he seldom dined out more than two or three times a year while at the Cape. Nevertheless, when social duties did claim him, there was no one who could throw himself more heartily into the fun of the thing.

Thus in 1880 or 1881 a Caledonian Society was started at Cape Town, of which he became a member. He used to enjoy relating how once he assisted a Highland regiment quartered there to celebrate a certain St. Andrew's night. After an excellent dinner in mess, with the time-honoured accompaniments, they adjourned, in the small hours of the morning, from the barracks to the castle, headed by pipers, and began to dance reels in the centre of the castle square, baths having been fetched from the bedrooms to serve as bass drums to augment the sounds of the bagpipes. These proceedings were not conducive to the slumbers of the officers quartered in the surrounding houses, but, to judge from the faces peeping from behind blinds, were not without interest to the lady members of their families. The next morning Colonel Bruce received a savage message from General Leicester-Smyth (then commanding the forces in South Africa) animadverting strongly upon the barbarous customs of his countrymen, and conveying an official reproof for their unseemly con-

duct, a reproof which was not received by the assembled officers entirely in a spirit of correction, for an irrepressible laugh was the chief result.

As to the Caledonian Society, of which, later, he became President, he always averred that their dinners were decorous, "though jovial within reasonable limits." After one of these dinners, when returning home at a reasonable and seemly hour, he encountered, in the railway station, Sir Thomas Upington, who had been presiding over a dinner of a different society called the Cape Town Highlanders; and who administered a severe reproof to his friend in the words, "Gill, you're beastly sober."

The astronomer's keen enjoyment of all forms of sport, in season, brought him closely in touch with every one. He used to tell of an extraordinary scene on the occasion of a great cricket match against an English team in 1895, which brought all Cape Town to the Kenilworth cricket ground, even the banks being closed for the occasion. The game had reached an exciting stage, when telegraph boys began to appear, one after another, delivering messages to the Cabinet Ministers, and others, to the effect that Jameson had crossed the border. As he told the story the double excitement was extraordinary. A man would be applauding a good hit or clever catch, and next moment receive a telegram of vital importance. He would gather his friends round him and gravely talk the momentous matter over, and next moment would turn to applaud another hit or another catch.

CHAPTER XI

EARLY WORK AT THE CAPE OBSERVATORY (1879-82)

Inadequate equipment—Gill buys a heliometer—Elkin—Star distances—Sir Thomas Maclear—Comet of 1882—Photographic star charting—Airy's retirement.

GILL's joy in his new appointment would have been greater if the observatory had contained even a single instrument of any kind fitted for carrying out the refined measurements which he had looked forward to as his peculiar province for advancing astronomy.

His splendid *History and Description of the Cape Observatory* has told astronomers of the wretched equipment. Instead of despairing, he set to work to make the best use of the means at his disposal, and to insist upon the necessity for first-class instruments of precision.

After the first year he sent to the Admiralty his "Report of Her Majesty's Astronomer at the Cape for the year 1879-80." This report has been lost in the Admiralty Archives, but is frequently referred to in the correspondence preserved at the Admiralty.

Sir George Airy's "Notes" upon it are preserved. They are in Airy's handwriting, and give his strong support to almost every paragraph. Speaking of Gill's discovery of a difference in personal equation according as a star transits from right to left, or from left to right, Airy says: "The inferences drawn here are remarkable, and will probably be recognized as valuable." He applauds the fine work on occultations. He concludes thus—

I have passed over many paragraphs explanatory of what has been done under Mr. Gill's direction or by himself personally, all bearing evidence of the vigour with which the work of the Cape Observatory has been carried on. I regard the Report as honourable to Mr. Gill.

Sir George Airy's world-reputation enabled him to adopt this helpful patronizing tone without giving the slightest offence. No lesser man could have done so, for the Cape Observatory was not officially under his control.

David Gill soon proved himself to be different from all his predecessors in having the dogged persistence and force of character required for overcoming official inertia at home, and for raising the status and equipment of the observatory to the very high level demanded by its unique position of importance for the southern heavens. These qualities, combined with honesty of purpose, deference to Admiralty authority, and a cheerful devotion to duty, ensured his ultimate success.

His dogged persistence even in small matters became proverbial, and in this connexion a tale of the Admiralty may here be told.

There was at one time a carpenter attached to the observatory, and the distance of his house from his work interfered with his usefulness. In one of the reports to the Admiralty, Gill asked that a carpenter's cottage should be built on the grounds, and his request was refused. Every year after this, the request was repeated in stronger terms. At last the First Lord, or other high authority, exclaimed, with a laugh, "For goodness' sake let Gill have a carpenter's cottage, or we shall never have peace."

Thus, in the course of twenty-eight years, he gradually transformed the small collection of poor instruments in a wilderness into the present magnificent observatory in lovely grounds with instruments of precision unsurpassed in any quarter of the world. The history of all this, so

far as it is told in his great book, need not be repeated here.

At this period Sir George Airy and David Gill always worked hand in hand, with singleness of purpose to advance astronomy.

On June 19, 1879, Gill wrote to Airy a very long and amusing account of the horrible condition in which he found the observatory, asking for his help with the Admiralty to set things right, and explaining the steps that he was taking to improve matters. Four weeks later he writes—

TO SIR GEORGE AIRY

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1879, July 14.

DEAR SIR GEORGE,—I hope you received my last letter. The Observatory is now reduced to a tolerable state of cleanliness and order. [The letter proceeds to tell what he has been doing.] All things go well so far as discipline and progress of work are concerned. . . . We enjoy most excellent health, my wife particularly is greatly benefited by the climate. Indeed I can conceive nothing more charming than the weather just now. The winter of South Africa seems to me far finer than that of Egypt. Perhaps we shall have another tale to tell in summer, or after we have encountered some of the "south-easters" of which we have heard so much and seen so little.

Meanwhile Mrs. Gill desires to unite with me in kindest remembrances to yourself and all your family circle.

Believe me, sincerely yours, DAVID GILL.

Airy, in his reply of August 12, 1879, concludes with a droll allusion to the hot weather.

Pray give my best respects to Mrs. Gill. I am glad to hear she enjoys the climate thus far. It is, however, hot in summer. Sir John Herschel cooked Irish stews by solar radiation.—I am, my dear Sir, yours very truly,
G. B. AIRY.

Sir George's fears were only too soon realized. The very first hot weather affected Mrs. Gill's health, and afterwards was always a source of anxiety. Her need to

recruit in England so soon as 1880 was a blow to her husband.

Nor was this the only sorrow during the early days at the Cape.

TO SIR GEORGE AIRY

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,

1879, *July 14.*

MY DEAR SIR GEORGE,—I write to tell you that Sir Thomas Maclear died this morning. He has been confined to bed since the time of my arrival in the Colony, but it is only in the last fortnight that his friends thought him to be dangerously ill.

I have seen him three times. On the two last occasions he was very weak but full of pluck, and declared that he was quite well. The first time I saw him he was full of anecdote and fun, and his intellect was as clear and fresh as possible.

He impressed me as a man who must have been full of restless energy, a man of many sympathies, full of heartiness, and full of his work too. His observing books bespeak the man. There is a scrupulous care about the notes, a constant personal attention to every detail, and an amount of personal labour in observing which few men have equalled.

One constantly finds that he has been at work till daybreak. He seems to have been impressed with the idea that there was an enormous amount of work to be done, and that he would do it—and to have forgotten that till it was published it was not done.

Still, there the work remains, and is available for reduction and publication, and I hope I shall be able to produce much valuable metal from the ore which Maclear has collected.

Sir Thomas is universally respected and loved in the Colony. We bury him on Wednesday, beside his wife in the Observatory Grounds, near the spot where Fallowes lies.

TO THE EARL OF CRAWFORD AND BALCARRES

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,

1880, *January 9.*

MY DEAR LORD CRAWFORD,—It is with deep regret that I have read the announcement of your father's death.

I hope you will allow me to express my sympathy with you in your great loss, for I have known you too long and too well not to understand how keenly you will feel this bereavement, and that no consideration of change in your future position and life can make up to you for him that is gone.

I think of Lord Crawford as one of the most truly estimable men I ever met—so kind, so gentle and so cultured, so strong and determined in the right.

It would be mere presumption on my part to say more; I hope you will forgive my saying what I have said. But it is not always intimacy or even frequency of meeting that causes another to influence one's life. To Lord Crawford and to you I owe my emancipation from uncongenial work, to his clear foresight I owe the overcoming of countless difficulties afterwards—and thus, though our spheres of life have been totally different, and though we have but seldom met, I feel that Lord Crawford has much influenced my life, and that his influence was ever for good.

Such are my excuses for intruding my sympathy upon you just now. I trust you will accept both the one and the other; and that, after time has healed the wound you feel so keenly now, you will long be spared to discharge the many important duties that now devolve upon you.

Believe me, sincerely yours, DAVID GILL.

Sir David Gill's official life and work at the Cape is naturally divided into periods by his occasional visits to England, especially those of 1884, 1887, 1896, and 1900.¹

Naturally, during the first of these periods, from 1879 to 1884, the seeds were sown that bore fruit later. There were plenty of plans to make, plenty of observations and reductions to carry on from day to day.

His favourite instrument of precision was still the heliometer. But a powerful telescope seemed to him almost a necessity, if only for micrometrical measurements to give the distances of the stars. This was the most difficult and refined kind of observation known to astronomers; full of pitfalls for the unwary, and

¹ Other visits home were in 1891, 1893, 1904.

therefore it seemed to him the most worthy of his attention.

He had never lost touch with Mr. Newall, and the magnificent 25-inch refractor offered him on loan. And when last at Strassburg he had found an enthusiastic young American student who offered to join him in measuring stellar distances.

TO MR. ELKIN

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1879, *June 21.*

DEAR MR. ELKIN,—I ought to have written you some time ago on the subject of the Newall telescope, in order to give you some idea regarding it, and to enable you to judge how far it will suit you to put into execution the plan we talked of, viz. your coming to the Cape of Good Hope to assist in the work to be done with that instrument in the event of its being erected for work there. . . .

The actual steps which are accomplished facts are—

1. Mr. Newall permits the loan of the Instrument for seven years at least, the only condition being that it shall be under my direction.

2. Mr. Nasmyth promises £1000 towards the expenses.

3. Mr. Siemens promises £250.

4. Mr. De la Rue says he is prepared not to let the matter stop for want of money—that he will take the responsibility of money matters on his shoulders.

5. Mr. Spottiswoode (President of the Royal Society, and of the British Association) promises to support an application, with every prospect of success, for £150 per annum from each of these bodies. . . .

Believe me, sincerely yours, DAVID GILL.

In spite of this generous support, it was felt in England that the loan of an instrument was not a right solution, and a proposal that the Admiralty should purchase such an instrument was fully discussed. There is a long report by Airy which, by request of the Admiralty, he wrote out. It is a strongly worded note, expressing the opinion that Mr. Gill ought to be supplied with such a telescope. But the Admiralty came to the conclusion "that the time was not ripe for such an extension of the

functions of the observatory as would be involved by the purchase of such an instrument."

Airy was disappointed, but tried to cheer up Mr. Gill. He even congratulated him upon this decision, as it would give him more time to continue his valuable surveys. Parts of the reply to his letter are quite interesting.

TO SIR GEORGE AIRY

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1880, *January 20.*

MY DEAR SIR GEORGE,—In reply to your letter of Dec. 7, I am glad that you approve of my general scheme for the survey. . . .

I do not at all agree with you, however, as to the good fortune which befell me in the failure of the 25-Inch Equatoreal scheme. Our present Equatoreal is really fit for nothing but observing occultations of stars by the moon and phenomena of Jupiter's satellites. . . .

I do not propose to extend the labour engagements I have undertaken, detailed by you in your letter of December 7. I only think that the work under heads 2 and 3 should be executed with good tools and not with a practically obsolete instrument. I do not, however, propose to push the matter of the equatoreal till I have been able to show that we really want it, and that we are doing good work that deserves encouragement, and then I hope to get an instrument worthy of the observatory and of the situation. . . .

With kindest regards to your family circle, in which Mrs. Gill desires to join me,

Believe me, sincerely yours, DAVID GILL.

Before leaving England, however, he had prepared the way for measuring some star distances, using the old instrument which had served him so well in the past, as shown in the following letter of earlier date.

TO SIR GEORGE AIRY

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1879, *October 13.*

DEAR SIR GEORGE,—By the same mail with this I have written to the Secretary to the Admiralty requesting that

their Lordships may be good enough to provide transport for my Heliometer to the Cape.

I purchased the Heliometer part proper from Lord Lindsay, and have had a very firm and satisfactory Equatoreal mounting made for it by Grubb of Dublin, at my own expense, with clockwork complete. I propose to erect the Instrument in place of the old, and now decayed, 3-inch Equatoreal, and devote it chiefly to parallax investigations. From the experience I have had in the use of the Instrument, and the opportunities in the Southern Hemisphere, I think very valuable results might be obtained.

I have no doubt the matter will be referred to you, and I hope you will kindly support my proposal.

All is going well. I will write you soon on the progress we are making.

With kindest regards to yourself and your family circle, in which Mrs. Gill unites with me,

Believe me, sincerely yours, DAVID GILL.

Accordingly, the dearly loved heliometer arrived in December 1880; and, the next month, his young friend Elkin, the Strassburg student, paid him a visit lasting till May 1883, two years and four months. Thus began the first systematic attack ever undertaken upon star distances; and the splendid results obtained by Gill and Elkin are well known to all astronomers.

The history of astronomy is full of examples where fortune has seemed to favour the brave, or rather where success has bred success; where at least it might be said that a piece of luck came to those who deserved it. Thus did Sir William Herschel discover the orbital motions of double stars when attempting to measure their distances; and Bradley the constant of aberration. The society founded to search for a planet between Mars and Jupiter had no success, but Piazzi, when laboriously charting the stars in 1801, accidentally discovered the first minor planet.

So also, during Mr. Gill's first period (1879-84) at the Cape, an event occurred which enabled him to originate

a new kind of astronomical observation, the systematic charting and cataloguing of the stellar heavens by aid of photography.

In 1882 a brilliant comet appeared in the southern heavens—so brilliant as to be seen in full sunlight, even when it seemed to reach the sun's edge. While it was still a magnificent spectacle in the hours before dawn, wishing his friends in England to share his joy, the idea occurred to him to strap an ordinary portrait camera to the clock-driven equatoreal. This enabled him to follow the comet and to expose the plate for hours, always keeping the cross-wires of the telescope on the comet's head. Sometimes also he kept them always on one of the stars.

The results were a revelation to him and to all who afterwards saw the photographs. In his *History, etc.*, he has told how he was immediately convinced of the possibility of thus constructing star maps on any required scale, down to any required order of magnitude. The large field, giving sharp definition, led him to expect better work from the doublet portrait lens than from a telescope. He immediately wrote to Dallmeyer for a larger lens, to test the idea, and found it gave fine results. He obtained a photographer from England by a grant from the Royal Society, and, assisted by funds from Mr. Nasmyth and from his own pocket, set up an efficient apparatus to photograph and to catalogue all southern stars down to the $9\frac{1}{2}$ magnitude. Thus he was able to extend the most useful existing star-catalogue-of-identification, viz. the *Bonn Durchmusterung* of Argelander and Schönfeldt, right on to the South Pole, in the "Cape Photographic Durchmusterung" (C. P. D.).

The progress of this has been fully told in other publications. Isolated photographs of star groups had, before 1882, been taken by Rutherford, though it was later that Bauer and others measured them (*e. g.* to find the parallax of μ Cassiopeiæ). Gould, too, had made isolated star

pictures at Cordova. Gill was the first to use photography for star charting.

Gill's comet picture with its multitude of stars convinced the brothers Henry of Paris Observatory that their catalogue of zodiacal stars could best be completed by photography. They then constructed the first of those 13-inch astrographic telescopes which have been used all over the world for the International *Carte du Ciel*, started by Admiral Mouchez, with the help of Gill and the brothers Henry, at the Congress of Paris in 1887.

These were some of the results of Gill's accidental discovery. It also led Dr. Barnard at the Lick Observatory to strap a portrait camera to the equatoreal, and, by eye-correction of the driving-clock, to produce, with the most exhausting patience, those marvellous pictures of the Milky Way which have added so much to our knowledge.

At about this date, in 1881, British astronomy, and the Cape Observatory, suffered a terrible loss by the retirement of "dear old Airy" (as Otto Struve and other intimates spoke of him in their letters) from the post of Astronomer Royal. There were no young men in England of the Airy and Adams type. Sir William Huggins has truly remarked (see p. 49) that such young men, who might have continued the succession of these earnest, unselfish devotees to astronomy of precision, had wandered into the more promising realms of physical research. All the younger British astronomers admitted that among themselves there had as yet appeared no Halley or Bradley or Airy to represent British astronomy at Greenwich. Still, astronomers hoped that Airy's organized and systematic methods might still suffice to maintain something of the continuity of observation and reduction which was an outstanding characteristic of Greenwich Observatory.

Mr. Gill had not yet established his exceptional capacity

for conducting the routine of an observatory, and his present duty clearly held him at the Cape. The post was given to Sir George Airy's chief assistant, Mr. W. H. M. Christie.

Meanwhile, Airy's interest in the labours of his astronomical friends continued unabated; and those who retain affection for his memory will enjoy, in the following letter, traces of the inner man that were not shown to the world at large.

FROM SIR GEORGE AIRY

THE WHITE HOUSE, CROOM'S HILL,
GREENWICH PARK, S.E.,
1883, *June 2.*

MY DEAR SIR,—Thank you much for the photographs of the Comet *b* of 1882, which reached me in a single packet two or three days ago—having been preceded by one enclosed in a Cape publication.

I am surprised at the accuracy of the photographs, with the long exposure which I understand you to have given. For, first, the sidereal objects, the clock-movement must have been exceedingly accurate. And, secondly, the comet, it must have been almost stationary in the heavens (I have not looked to numbers connected with the comet's place), as your times of exposure extended from 30 m. to 1 h. 50 m. and 2 h. 20 m. I saw the tail of Donati's Comet sweep across Arcturus. I have no record of the time occupied, but it was certainly less than some of these.

I shall be glad at all times to hear of your daily proceedings, private and official. I see all that appears in the Monthly Notices and in the *Observatory*. But I do not go to London or into society; and even when friends call on me, my increasing deafness deprives me of much that I might be supposed to receive from them. It had been my wish to retire from the Observatory in the summer of 1880, but the old Transit of Venus was still hanging over me. My part was cleared off in the summer of 1881, and then I took my opportunity. It was time to do so, for my powers of endurance of official work were sensibly diminishing. Moreover, my retirement has enabled me to take up some private astronomy from

which I had long been blocked out. And it was curious that after looking at numerous houses on all sides of London, I at last found the most convenient of all (for my wants) in this house, the very nearest of all to the Observatory, and with a gate of the Park immediately opposite, at a distance of about five yards, to one of my doors.

The work of this Transit of Venus [1882] will be a trifle compared with that of 1874. I was obliged then to fix upon dreadfully almost unapproachable places with no means for longitude except the most laborious.

I beg you to offer my sincere respect to Mrs. Gill. I and my daughters will be glad to hear of her.—I am, my dear Sir, yours very truly,

G. B. AIRY.

David Gill, Esqre.

It may be well, at this stage, to forestall events and to insert a selection of a few letters from those retained by Sir George, placed at the disposal of the present writer by his son, Mr. Wilfrid Airy.

TO SIR GEORGE AIRY

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1883, *December 18.*

MY DEAR SIR GEORGE,— . . . I have now after four years' work arrived at a pretty clear notion of what I can accomplish, and of what I want. [Here follow details of a proposed systematic research on the parallax of stars down to the fifth magnitude, sixteen of each magnitude-interval, and of sixteen stars of large proper motion.]

I am willing to give up my rest at night for the next ten or twelve years for this work (*and to do the work with my own hands*) if Government will give me the necessary means—a 7-Inch Heliometer. . . .

* * * * *

TO THE SAME

26 UNION PLACE, ABERDEEN,
1884, *August 1.*

MY DEAR SIR GEORGE,—To-morrow we leave for London—sailing thence on Aug. 20 for the Cape.

Herewith I send you photograph of my portrait—



[To face page 138.]

SIR GEORGE BIDDELL AIRY, ASTRONOMER ROYAL.

painted by my friend Sir George Reid—and especially beg that you will remark the bundle of papers on the table—duly punched with your machine, and duly bound with boot-laces after your manner.¹ We hope to have the pleasure of seeing you again before we sail.

Our friend Christie has probably told you that the Admiralty has granted me £2700 for a new Heliometer and its observatory. . . .

This correspondence with Airy may well conclude with a much later letter.

TO SIR GEORGE AIRY
(on his ninetieth birthday)

6 PORCHESTER GATE,
1891, *July 25.*

MY DEAR SIR GEORGE,—I must write a word of farewell, to say once again how deeply my wife and I regret that we cannot be with your birthday party to-day.

Our leave has expired, and as your friends assemble we shall be sailing for the Cape. But we shall be with you in spirit, and drink on board a hearty toast to your continued health and happiness—coupled with the wish that you may see as many happy returns of y^r birthday as you and yours desire.

In grateful remembrance of our always happy relations both private and official, and with love and honour, Believe me, always sincerely yours, DAVID GILL.

¹ [This portrait is reproduced in the frontispiece. Later oil-paintings of Sir David Gill are in the Royal Society (by Mr. George Henry) and in the Russian Imperial Observatory, Pulkowa.]

CHAPTER XII

CORRESPONDENCE (1883-4)

Elkin—Survey—Sir William Morris—Gordon Duff—Theatricals
— Stellar parallax—Christie—Simon Newcomb—Astro-
nomical ideals.

IN the meantime the Gills had welcomed astronomers *en route* for their stations to observe the Transit of Venus on December 6, 1882. Among these was Professor Newcomb from Washington, U.S.A., destined to become the foremost of theoretical astronomers. The renewed intercourse of these two representatives of astronomy, on its theoretical and practical sides respectively, was of great value to the science. It increased their intimacy. Each saw what great help he could get from the other. Gill always obtained much useful information from Newcomb about the progress of his planetary tables, etc., while he undertook in return to supply him with planetary data and lunar occultations whose accuracy would be the highest possible. From this date onwards the correspondence between these two reached formidable dimensions.

Elkin left the Cape of Good Hope in May 1883, having helped Mr. Gill in splendid work on stellar parallaxes with the heliometer, and for a time the house seemed to be deserted. He had been such a welcome guest that his presence was sadly missed.

TO MR. ELKIN

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1883, June 5.

MY DEAR ELKIN,—It is too bad that I have allowed two mails to pass without writing you. Not that I have

not thought of you—I have missed you badly—as I wrote Gould, it was like having a tooth drawn, and I would gladly give my soundest grinder to see you opposite me as I write.

I duly received y^r welcome telegram from Madeira.—My wife and I had been at a Shakespere reading at Mrs. Dyce's, and when we came home I turned into my room for something, when I heard excited sounds—"David—what's this?—a letter!—David, it's from Madeira!" Many were the blessings showered on your head. We are now anxiously expecting your news in detail from St. Helena.

* * * * *

Captain Morris and the party of R. Engineers come on Wednesday or Thursday by the *Pretoria*. Morris will be here for a few weeks making necessary arrangements with me and doing a little practical astronomy—and then I think I shall go up to Natal and start the Base Line—the preliminary surveys being meanwhile made by Lieut. Laffan and his men.

We are making great preparations for a photographic campaign. The Photo house is being put in fine order. . . .

My wife is much better and I hope to take her to Natal with me for a change. Everybody desires to be remembered to you. My wife sends her love, and has written to y^r Mother—letter enclosed.

I am waiting very anxiously for all your news.

Believe me, dear Elkin, Always y^r Sincere friend,

DAVID GILL.

TO MR. ELKIN

1883, August 12.

MY DEAR ELKIN,—I was delighted on my return from Natal a fortnight ago to find your long and welcome letter waiting me. I will tell you of my own doings before going into the matters suggested by your letter.

Capt. Morris and his wife arrived here about nine weeks ago. They spent a fortnight with us. Morris is a very fine fellow, earnest, energetic, and full of enthusiasm. He brought out the 18-inch Alt. Az. for the survey, of which you have seen the photograph. It is truly a splendid instrument. . . . The watch telescope is a powerful adjunct.

. . . Every evening so soon as it was dark I took a set of the faint α Centauri pair with the Heliometer, Morris smoking and booking. Then we dined, and then went off to the Theodolite and observed azimuths for practice till ten or eleven o'clock. Then a smoke, then off to the Heliometer for another set of the faint α Centauri's. I send you the results. We had a good deal of cloudy weather, but I lost no chance. After a fortnight of this we started for Natal, had a beautiful passage and arrived safely. Then we had a busy week or ten days in Durban, getting tripods made for the Base Apparatus, and a thousand and one odds and ends together. Then off to Pietermaritzburg. There we had to buy wagons, get tents made, buy horses, oxen, and supplies of all kinds, and start on the definitive selection of the base. We got a capital $2\frac{1}{2}$ mile base and an almost theoretically perfect series of stations for extending to the first 30 mile side. We have also with a map, and with local enquiries and information from the Surveyor General's office, practically planned the triangulation of Natal, and have sent a young fellow (son of Colonel Hassard) with a sapper, to test finally whether all the necessary stations are mutually visible.

It does not take long to tell this, but it took a fortnight of very hard work to do it.

Then we got the Camp in order, got out the Base Apparatus, set up a trial line, and began the drill for working the Base Apparatus. We got this all into good working order, and I kept them busy pegging and clearing *the* line, laying down the terminals and preparing for real measurements. I could not afford to stay longer, but I feel sure I left all in good hands and with every prospect of a successful issue. Morris will come here with the Bars in December when we shall compare them with the standard Bars, and I shall then take home one of the standards for comparison in England.

We lived a week at an hotel, then my wife went to the Gordon Duffs¹ for a week, a visit she immensely enjoyed, and for the remaining fortnight we had our headquarters at Government House, and found Sir Henry Bulwer a very kind host. Then we spent a couple of days with

¹ Mrs. Duff was a very dear friend of Mrs. Gill's. Her husband is an Aberdeenshire laird. They were in Natal for Mrs. Duff's health.

the Bayntons at Durban. Neison has really a charming little observatory, and his equatoreal after some little alterations is really a very nice instrument. . . .

We had a most abominable passage back, my wife more or less sick for five days, excepting a few hours on shore at Port Elizabeth. On the whole, however, my wife is greatly benefited by her trip, and I am in every way satisfied with it. By the bye, she wrote you last mail. I only wish to add my thanks to hers for all your great kindness to Bessie [his sister-in-law], kindness we shall never forget.

I am sorry that you did not see Christie or Hind. . . . I am very glad you have made some more London astronomical friends, and hope to have your opinion of the Oxford Heliometer and of Common's telescope. . . .

Give my kind remembrances to your Mother and Believe me Always your sincere friend, DAVID GILL.

TO MRS. GORDON DUFF, IN NATAL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1883, *September 17.*

MY DEAR MRS. DUFF,—Not a mail has passed since my return to the Cape without creating the intention to write you. Now for Mrs. Duff—says inclination—yes, says duty, but just clear off this bit of work first. But bits of astronomical work have a universal habit of taking more time than the most unsanguine man expects, and so before that special bit of work is done—another English mail arrives, and the Natal mail is off, and Mrs. Duff's letter waits for the next "bit" with a like result.

In fact these good intentions, with which a very unmentionable place is supposed to be paved, have been very prevalent with me of late—and I should think that Auld Clottie's hottest corner is in pretty good travelling order within the past six weeks from my work alone. But this time the bit of work shall wait.

* * * * *

What a bright happy visit we had with you!—My little wife has never been so well since October '79—those happy quiet evenings with you we shall not forget for many a day.

I often picture you and your sister together—for I seem to know Mrs. Graham Smith from her letters—I wonder if I do?—Something very earnest about her like Dorothea in *Middlemarch*, and something of the pithy sparkling character of Jane Carlyle. Have you read the latter's letters?—if not, do so.

Just now I am observing from 7 to 9 in the evening and 3 to 5 in the morning, so at 9 o'clock my long pipe is filled and my wifie reads these letters to me. Oh the sparkle and fun of them when all is well—the marrowfull, earnest stuff—the brilliant description—and, shall I say it? the delightful touch of occasional deviltry sometimes—how you and y^r sister w^d enjoy them together!

And what are you doing? How finds y^r sister, Natal? Can her deft brush find anything to do, and is there much to tell in her vigorous charming way to those at home? Above all, I hope that y^r next news of y^rself will be bright as that you have sent.

For ourselves—Wifie is not quite so well—the gain from Natal is not lost, but she has now and then a good deal of pain. . . .

By the bye, y^r sister goes in for Astronomy, so she will be interested to hear that Sirius is not so far off as she has been taught to suppose; that it has a parallax of 0".38—in other words that light which takes 8 minutes to come from the sun, would reach Sirius in only 9 years—instead of 30 years as I suppose she has read.

Baron Hubner lunched here one day. When we spoke of "you two" he held up his hands and said, "Aaahhh charrming"—with a deep inspired "Ah" that no letters can convey, and an amount of R that no Aberdonian could rival. I met him also at dinner at Mrs. Koopman's. . . .

Now my cigar and my paper are done. My wifie sends her love—and I kiss my hand as of old.

Believe me Y^r sincere friend,

DAVID GILL.

Shortly before the astronomer went to England on his first furlough, in January 1884, he had staying with him the head of his Natal survey, Captain (now Colonel Sir William) Morris, R.E. His great appreciation of the man, apart from his professional capacity, can best be

understood by extracts from a letter, dated January 14, 1884, to Mr. Gordon Duff.

Morris has been with us for the past month. He is a very splendid fellow—as high souled, pure minded a man as I ever met—full of work and full of earnestness, and fun too.

* * * * *

I must not omit to tell you that my wife sends Mrs. Carlyle's letters by Morris—and do not omit to address Morris as "Prince Geraint." Amongst all our work we found time for one evening's fooling in the way of "Tableaux" at Mrs. Trimen's (newly married wife of Trimen, Curator of Museum).

Morris was Geraint, Miss Ebdon Enid, and I the Count Doorm.

Geraint is just recovering from his faint, I trying to force Enid to drink, Geraint observes my brutality and is on the point of springing up to chop off my head—retainers, men and women, jeering at Enid. Morris was coaxed by Mrs. Trimen, Miss Ebdon and my wife—till driven by despair he said in a weak moment, "Do with me as you please." Whereupon the ladies set about equipping him in scale armour and red hose. This reduced Morris to despair—he went about deploring his fate—"Fancy me in scaly armour and red hose!" They let him off the scaly armour, but draped him in a doublet and tunic, retaining the red hose, and he certainly made a very fair appearance—he is as good-looking as he is good. Our "Spectacle" was the first and so we clothed ourselves in more conventional garments and watched two other scenes from Tennyson and four Tableaux from the *Odyssey*, "Penelope and her sisters"—and the return of Ulysses. All very nice, but to my mind the fun of the fair was all beforehand—the ridiculous figures of half draped early Britons and classic ladies—beards suitable and unsuitable—coming off and going away—and specially of a gallant Captain who came to rehearsal and brought his classic tunic but forgot his drawers—was asked to draw down a window, and in his hurry to oblige jumped on the sill, suddenly remembered his missing garment and the probable consequences,

blushed scarlet, jumped down and rushed from the room.

But Morris and his performances here, with his red hose, and his tunic turned into a skirt, doing a ballet whenever any attempt was made to "fit" him, make me still roar with laughter when I think of it.

What a lot of rubbish to tell you! It's bed time now, Good-night.

Naturally enough, during this first period of residence at the Cape (1879-84) his letters to friends at home were full of his astronomical work, and were much taken up with the parallax of the stars.

TO MR. E. B. KNOBEL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1882, April 17.

MY DEAR KNOBEL,—Many thanks for your kind letter of Feb. 18 and its cordial congratulations.

I need not tell you that I am much gratified by receiving the Gold Medal, and I like it so much that I mean to try and win another.

Now let me congratulate you with all my heart on your election as a Secretary of the Society.¹ . . .

I am busy organizing the observations² of Victoria and Sappho in July, Aug^t and Sept. . . .

We are busy reducing the longitude work. It is a long job as the places of the Time Stars had all to be determined, as well as those of the Circumpolar Stars.

I have to-day sent to press a *Catalogue of Circumpolar Stars* (88 in number) which I propose to issue in a fortnight for the use of the Transit of Venus observers in the Southern Hemisphere.

Probably the most generally interesting researches which I have that are approaching completion are those on the parallax of some Southern Stars. Elkin has computed his observations of Sirius, which go to show that

¹ [Royal Astronomical Society, of which Mr. Knobel was Secretary for ten years and afterwards President twice.]

² These came to no good end owing to defects in instruments in the northern hemisphere with which comparisons were to be made. Cf. letter to Kapteyn, November 20, 1893.

the generally accepted parallax of this star is much too small, and that the mass of Sirius (from Auwers' elements of its orbit as a double star combined with the parallax found by Elkin) is really less than that of the Sun.

My own researches on the same parallax, with different comparison stars, will not be concluded till the beginning of next year. . . .

The whole of Elkin's work combined with mine is greater in extent than all the existing parallax determinations put together. Every clear night we manage to get about 4 hours' work each, so that even at Ascension the old Heliometer never had such hard work before.

* * * * *

Mrs. Gill is better than she was when in England, tho' still an invalid, and unable for more than a quiet walk through the Observatory grounds.

* * * * *

Believe me, sincerely y^{rs},

DAVID GILL.

TO MR. W. H. M. CHRISTIE

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1882, *October 25*.

MY DEAR CHRISTIE,—I do hope you are well. I have been wondering much at not hearing from you. Nothing in the shape of news from you since your marriage! I was particularly anxious to hear from you about the R.S. We are very busy here about the Transit. Perry and Sidgreaves are off to Madagascar. They were put in quarantine at Durban, but I had heliostat flashes sent to them by Mr. Pett at Durban which have answered capitally. . . .

I expect Newcomb to-day or to-morrow, and Marth in a week.

* * * * *

We have of course been busy with the Great Comet, and Finlay and Elkin have got a great number of observations. I could not do much till after the Sappho observations were over, which tied my hands till Oct. 18. I send you, however, some photos which I got Oct. 19, 20 and 21. . . .

I see that Barnard's Comet is in my hunting grounds now.

* * * * *

But with two comets, four Transit of Venus stations, with which I shall have more or less to do, my own Heliometer stellar parallax work, and normal observatory work, and my two chief assistants gone and one an invalid—my days will not be idle till the end of the year.

* * * * *

I am happy to say that my wife has been much better during the past fortnight—and this makes hard work very easy.

What a pity you did not get my telegram of Sept. 9!!! You would probably have seen the transit of the Comet, or at least it would have been seen in America nearly at noon with big telescopes.

My wife joins me in kind regards to Mrs. C. and y^rself.
Always sincerely Y^{rs}, DAVID GILL.

As we approach the end of Gill's first period of five years' continuous residence in South Africa, it must be noticed that these years influenced him a great deal, by giving scope to his character, but most of all by the growing friendships with those men in his own line whom he most respected, friendships which commenced with mutual esteem, but deepened into affectionate regard.

This fullness of life in regard to the master impulse of his being, his love for astronomy, reached a climax at the time of the transit of Venus in 1882, when David Gill and Simon Newcomb first became intimately associated together, and when each found in the other the counterpart of his own labours. They had first met at Hamburg, in 1873. Newcomb had, even by this time, reached almost the highest position among the theoretical astronomers of the world; and, in the matter of uncompromising exactitude of observation, he found in Gill the complement to his own activities. Gill, on the other hand, found in Newcomb the man who had himself done so much for existing problems in astronomy

that he could indicate the directions in which an observer of acknowledged accuracy could best do service to astronomy.

The voluminous correspondence between these two men on varied problems indicates how much we owe to their joint interests; and it is delightful to recognize their frequent admixture of fun and camaraderie with pure science.

In this connexion may be quoted the words of Newcomb's daughter, Dr. Anita Newcomb McGee, written in 1915.

I wish I could tell you how very warm was the friendship between these two, and with what appreciation Sir David was always spoken of. I am sure no one was dearer to my father personally, besides their scientific ties.

Unfortunately, there is not space in this volume to treat fully of the great astronomical problems discussed in Gill's correspondence with Newcomb and many others.

When Newcomb went to the Cape in 1882 he left his daughter Anita in England. She wrote her schoolgirl impressions to him, and these were talked over with much amusement by the two friends at the Cape. They always spoke of her as the "F. B.," meaning "Fair Barbarian," which was the title of a story by Mrs. Hodgson Burnett, then just published, about an American girl in England, where her English relatives were amazed by her original and independent proceedings. This will explain a reference in the following—

TO PROFESSOR NEWCOMB

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,

1883, May 23.

MY DEAR NEWCOMB,—It has greatly delighted me to receive your welcome letter of the 26th April.

* * * * *

The principal news since you left is that my good friend Elkin left 10 days ago. I miss him more than I dare well

say; both my wife and I do so. He had become part and parcel of us, always busy, always ready to discuss or argue any point, always genial and friendly.

* * * * *

I am very busy preparing for a trip home to England early next year.

* * * * *

Alas for the F. B.—I had hoped one day to look upon her—but the F. B. is no more—at least F still but not B—a pretty, proper, particular young lady, with a deportment formed on the papa-prunes-prism principle. Oh man! if you had only brought her to the Cape!—but you must be wrong, I believe in my heart she is as fresh and natural, as bonny and true—and the apple of your eye—as she was before. [She had evidently adapted herself to the country, when left in England, to a degree which led to comment on her father's part, to which this is a reply.]

* * * * *

We saw the article Cetewayo in *Harper*. It did not need a "facetious article in an American newspaper" to indicate the author. The old savage is being "eaten up," however, in Zululand. [Professor Newcomb visited Cetewayo while both were at Cape Town.]

My wife joins me in kindest remembrances, not only to you, but to Mrs. Newcomb and the F, quondam B,—both of whom we seem to know.

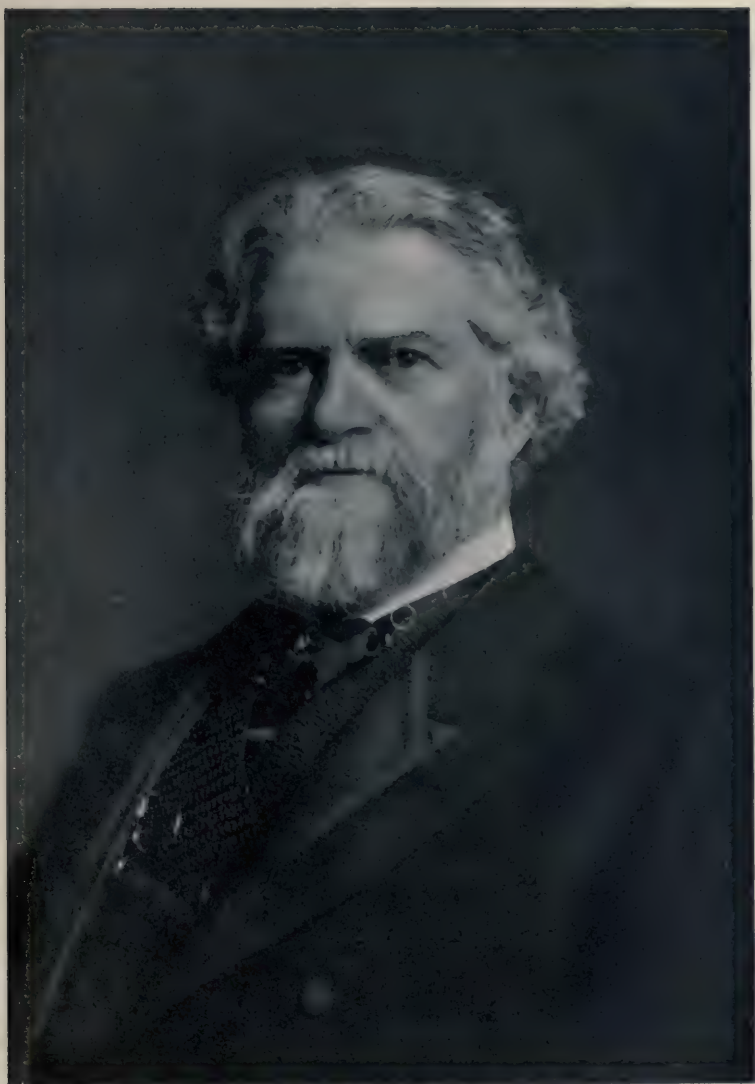
Always sincerely yours,

DAVID GILL.

TO PROFESSOR NEWCOMB

1883, December 16.

MY DEAR NEWCOMB, . . .—Have you seen Nyren's paper on the constant of aberration? I regard the agreement of the results by the three different instruments as the greatest testimony to the practical genius of old Struve, the designer of those instruments, and a proof of the perfect manner in which the tradition of accuracy and thoroughness which he established has been preserved at Pulkowa. It is a fact, I am certain, that in Meridian Astronomy we are retrograding. Put the observations at Greenwich or Paris or Washington or the Cape or anywhere else to the same test—and you



[To face page 150.]

PROFESSOR SIMON NEWCOMB.

will find them wanting. But the old Pulkowa observations, equally with the new, stand those tests which we cannot successfully apply to our modern huge instrument-, small accidental-, big systematical-error observations of the present day.

I wish they would let me put up a new Fundamental Meridian Observatory here—instead of this unwieldy, non-reversible, non-testable giant. For a differential instrument, I could not wish a better Transit Circle—but it is playing with Fundamental work to attempt it with such a tool. The fact of the matter is that laziness is at the bottom of modern degeneration in meridian observation. It is such a nice easy thing to turn loose some astronomical young gentlemen who are willing for a consideration and a Government appointment to devote a few hours twice a week to making what they are pleased to call observations with a huge machine which the roughest handling cannot disturb, whilst the great chief eats his dinner in a dress coat, smokes his cigar and goes to bed. In that way and by much printing a very great show can be made, but how much progress in Fundamental Astronomy?

But I am losing my temper on paper, because I cannot get all things as I would wish them. Who does?—Wait a bit—yes, wait and it will come all right. Meanwhile one grows old, and I suppose by the time my energy and strength are gone, I shall have all things as I should wish them. Perhaps then I shall have another Elkin beside me—some one who will work with the same devotion and love of truth for truth's sake. Who knows? That would be a consolation.

Forgive my Sunday afternoon grumble, and

Believe me, Always sincerely yours, DAVID GILL.

There was no one ever lived who was so anxious to have his conclusions tested by logical argument as David Gill. He desired only to get at the truth. He would start a subject with Newcomb and then say, "There is where I differ with you. Now you give me your reply, and we'll have a scrap!" He wrote to Newcomb in 1890, in such a case—

"Let's first shake hands before we box,
Then give each other friendly knocks,
With all the love and kindness of a brother."

So he held his views against his friend in such questions as the Transits of Venus, the last decimal place in the mass of Jupiter or the moon, or in the constant of aberration, and many other vital points in gravitational theory, in discussing which he—and his opponent too, as he knew full well—desired only to have his own faults exposed and the truth revealed.

CHAPTER XIII

FIRST VISIT TO ENGLAND (1884)

A holiday?—LL.D., Edinburgh—Admiralty and Treasury sanction purchase of new heliometer—Proposed Board of Visitors—The Gills' homecomings to the Cape—Christmas Day with the staff.

FOR a long time Mr. Gill had been looking forward to his visit, early in 1884, to Europe. He had prepared for publication a vast amount of his own work as well as the reduction of some of Maclear's observations of old date, and he desired to see these results through the press.

He was also, now as ever, hard at work in trying to improve the position of his staff, and in this connexion he wanted to introduce some necessary reforms, involving money grants, which could best be explained by personal interviews. But most of all, seeing his way to obtain valuable results if he could acquire a superior heliometer to the details of which he had devoted much thought and experience, he was determined to push his project through. Already, his earnest efforts in the United States of America had been rewarded; and had assisted his friend Elkin to obtain a powerful heliometer at Yale. He intended now to apply to the Admiralty for such an instrument to replace his own 4-inch heliometer with which he had proved the incomparable accuracy of his own observations.

TO PROFESSOR NEWCOMB

ROYAL ASTRONOMICAL SOCIETY, LONDON,
1884, *May 10.*

MY DEAR NEWCOMB,—I came to England for a holiday and I have never been so hard worked in the whole of my life. . . .

I have had four distinct and different matters to put before the Admiralty.

£1200, for repair and maintenance of buildings,
new house for carpenter and record room, above
last or any other year's estimates.

£450 for printing.

£400 a year to raise pay of assistants.

£2700 new heliometer and observatory.

The first two of these I have got, the two second have gone up to the Treasury with the strongest recommendation of the Admiralty—but my Lords delay their reply, and this involves labour ahead. I suppose you have sufficient official experience to understand the hard labour and heart-breaking loss of time which such a matter involves. For fifty years my predecessors have allowed matters to jog along, and naturally enough the Admiralty cannot understand why all this fuss and demand should arise, and I have had a very uphill fight, though I must say that my friend Christie has been a friend indeed, and has backed me up most thoroughly.

* * * * *

Then there has been the printing of Elkin's and my paper on the Parallax of Stars, and above all, the claims on my time of kind relatives and friends who think that the only object of a man coming to England must be to dine or to lunch, to shoot or to fish, to breakfast or to dance, to hunt or to play tennis—and although I have escaped much I have enjoyed some and suffered many of these things.

In addition to all this, I have been fool enough to engage in two distinct and separate pieces of peacocking—I have had my portrait painted,¹ and I have attended the Tercentenary Festival of the Edinburgh University, have worn a red gown and a velvet cap and so been for the second time transformed into a Doctor of Laws—what kind of laws I am learned in I have yet to ascertain.

Now the portrait I forgive myself for, because of the great pleasure it has given my little wife. I carried it yesterday to her room where she has been for six weeks under Dr. Playfair's charge, and she will have it beside

¹ [By Sir George Reid, P.R.S.A.]

her for another week—when she will emerge from her retreat, I hope and believe stronger and better than she has been for some years. But the portrait absorbed many a forenoon that should have been given to other work. The Edinburgh vanities cost me the loss of a visit to Pulkowa, and very nearly the gain of an attack of bilious fever. Still, the gathering was a very remarkable one—a red letter week in one's life that I should have been sorry to lose.

By the way—I understand that Piazzzi Smyth was expected to name two astronomers to be invited to attend the Tercentenary Meeting and receive degrees . . . one for Theoretical and one for Practical Astronomy. He gave y^r name and mine. The Senatus quite concurred but found that there was no time to write and get y^r reply and presence, and it had been resolved only to confer degrees on those who were present—but I understand that the Hon. Degree will be conferred on you afterwards.

After Edinburgh I went to Hamburg where I saw the mounting of the 30-inch O.G. for Pulkowa. It is the most rigid German mounting I have seen, and very conveniently arranged. I also went into great detail with Repsold about my proposed new Heliometer—and as to Meridian Instruments of the future. [I have a good deal to say on that subject, but am waiting for my time. You will see how very sharply dear old Sir George has risen (in the May *Observatory*) to defend the Cape and Greenwich Transit Circles.]¹ I then visited Berlin, Potsdam, Bonn, Strassburg and Paris. Of all these visits I might write pages to you, but must pull up.

* * * * *

Is there any chance of our meeting y^r wife or the F. B. if so let me know. I w^d go a long way to have the pleasure of meeting either one or the other. My wife has greatly benefited by her recent course of medical treatment—and I hope she will join me in all things, as of old, in about a week.—Ever thine,

DAVID GILL.

The energy with which Gill used to get the better of official inertia and red tape gained the admiration of

¹ These square brackets [] are in the original letter. On every other occasion where they are used in this book they indicate words inserted by the present writer.

his friends and the hearty appreciation of some Admiralty officials. He was, however, chary of mentioning his success in obtaining sanction for the purchase of the heliometer. But he derived much pleasure from the opinion expressed by Admiral Wharton, the hydrographer, who wrote, "You carried your heliometer business through by personal energy, and uncommonly well you managed it."

On arrival¹ at the Admiralty one morning he found that the question had passed from the Hydrographic Department and that before reaching the Treasury would pass through many hands and might be settled in about three weeks. After careful enquiries on general procedure he traced the documents and cheerily interviewed the official in whose hands they were, and explained the importance of the instrument and its uses. Thanked for his kindness in calling he was told the request would receive early attention and would probably be out of that room in a week or so; but Gill pointed out that it was essential that it should be through all Departments of the Admiralty and sanctioned by the Treasury to enable him to announce to the Astronomical Society Meeting that evening that the Government had sanctioned the purchase of the instrument. After suggesting that the official could write his brief minute at once as well as a week later his views prevailed, the minute was written, and he was entrusted with the documents for conveyance to the officer who was to deal with them next. The process was repeated and he hied him to the Treasury where he added to his former plea for haste the example of the businesslike way the Admiralty had dealt with the matter. The Treasury people humoured him, but the last man urged the utter impossibility of final Treasury sanction as the Financial Secretary was not in his office. Enquiry as to his whereabouts proved him to be at the House of Commons; so Gill hastened there and after explanations the Secretary agreed to the provision of the

¹ This account of the transaction comes from one of the staff of the Cape Observatory, Mr. J. Power, who probably had it at first hand.

heliometer; and a very happy Gill drove at once to the R.A.S. and made his announcement.

It has been said that Gill was always open for advice how to deal with the official of red tape; and he once told how such an official, during a discussion of observatory requirements, "became excited, and actually swore at me." When asked "What did you do?" he replied frankly: "I swore at *him*." It was then suggested to him that a better plan would have been to seem aggrieved and to propose an adjournment of the discussion till the next day, when his opposer would probably be less heated. Gill saw the truth of this and, lamenting that he had not known of it earlier, he resolved to broach the question again and try the experiment. It succeeded.

During their pressure of engagements the Gills were able to enjoy a well-earned rest at the home of his sister Maggie, Mrs. Powell, at Bury St. Edmunds.

TO MR. ELKIN

STANNINGFIELD RECTORY, BURY ST. EDMUNDS,

1884, *June 17.*

MY DEAR ELKIN,—You will, I am sure, be glad to hear that on Friday, the 13th inst., I got the consent of the Secretary of the Treasury to announce to the R.A.S. the same evening that the heliometer would be granted. Lord Northbrook¹ has been a very kind friend in the matter; his interest in it, I think, has been increased by a good deal from our old friend, Sir Fred. Richards. Christie also has backed me most thoroughly. I dined at the Admiralty on the 12th and Lord N. offered to give me a letter to the Treasury that I might push the matter myself.

Of course, I took advantage of such an offer, presented myself at the Admiralty at noon, and found that the letter of the Admiralty to the Treasury on the subject was not prepared. Armed with powers from Lord N. I pushed the matter through all the departments faster than anything of the kind had ever been done before, and set off for the Treasury. Got immediate access to

¹ [First Lord of the Admiralty.]

the chief permanent Secy, Sir R. Lingen, who said after some talk that he was favourable, but that Mr. Courtney, the Ministerial Secretary, must be consulted and he had gone to the House of Commons. After a little persuasion by stating that the last meeting of the R.A.S. came off that evening, he gave me a letter to Mr. Courtney, enclosed Lord N.'s letter and all the Treasury papers, and I set off to the House of Commons, found Mr. Courtney, went to his private room and got his consent after going into the matter.—Treasury consent had never been known to be obtained so rapidly before.—I think I have also brought about England joining the Metric Convention, at the same time. The two with my printing, will not be a bad piece of work for my trip home.

My wife got ill again—too much work in receiving and paying calls in London.

* * * * *

Now old man we must gird up our loins for our big parallax job¹ and carry it out manfully. . . .

We have a grand work before us—God grant us strength and health to carry it out.

My wife has been better since we came down quietly here. My sister has a charming place and is very happy.

We go north to Aberdeen in the end of the month, returning to London on 1st August.

With kindest regards to y^r mother and self, in which my wife unites, I am always, dear Elkin, your sincere friend,

DAVID GILL.

As already stated, since Airy's retirement there was no one who could take his place. The Cape Observatory had no Board of Visitors as Greenwich has. It does not appear that the Cape Astronomer was ever officially placed under any sort of supervision or control of the Astronomer Royal of the time as such. It is true that Airy in his autobiography, on the appointments of Henderson, Stone and Gill (but not of Maclear), to the Cape Observatory records the fact that he "gave them their instructions." Gill, however, certainly believed

¹ Determining solar parallax by observations of minor planets with their two heliometers.

that he was unfettered by any instructions.¹ Still, Airy had gradually assumed, with respect to H.M. Astronomer at the Cape, the same position that the Board of Visitors does to the Astronomer Royal. The anomaly was so likely to lead to trouble that Gill and Christie seem to have discussed the question amicably together.

Before leaving England Gill tried to get something settled, but without effect. Long afterwards, the failure of this effort was found to have unfortunate results.

TO THE ASTRONOMER ROYAL

1884, August 15.

MY DEAR CHRISTIE,—After much thinking over the question of a Board for the Cape Observatory, I have come to the conclusion that you should take the initiative.

* * * * *

I have spoken to Sir Fred^k Richards about an annual inspection by the Admiral at the Cape. His reply was a broad grin, and, "What a lot of plunder you'll get out of that.—What about those four loads of Admiralty stores you got out of me when I, in a weak moment, inspected you."

* * * * *

Always yours sincerely,

DAVID GILL.

The Gills returned to the Cape in September 1884. His voyage must have been a period of satisfactory enjoyment of the vast amount of work accomplished during his holiday, brightened by the improved state of his wife's health. He had obtained his first great desire in the ordering of a powerful heliometer. His next ambition, to have a perfect instrument for fundamental meridional astronomy, possibly also a fine telescope, might come in time. Meanwhile, his extension of Argelander's work to the southern hemisphere by photography was ready to advance, supported by funds administered by the Royal Society. He had passed many volumes and papers through the press. He had

¹ He makes this clear in his *History, etc.*, p. xxxix.

been in close touch with most of the great astronomers of Europe, and he was coming to his home to be welcomed by loving and devoted friends.

The mode of his homecomings after visits to England is given by Mr. Power, of the observatory staff.

His departures for holidays and his homecomings usually meant a gathering of the whole staff for good-byes or welcomes. In 1893 the incoming mail arrived after dark and anchored in the Bay. Colonel Morris and several of the staff went off in a tug, but unfortunately as they ascended the gangway on one side of the ship the Chief descended that on the other side to go ashore with the Medical Officer of Health. The visitors took vacant seats at the dinner table and an hour later, as the tug approached the docks, his cheery hail was heard from the pier. He had made Lady Gill comfortable in their waiting carriage, for neither would disappoint those who had come to greet them. When asked why they had not driven off on landing he answered, "We were certain some of you would be here, so, not finding you, I inquired and found you had gone off." Before the carriage started, news of every one had to be given to the cold and hungry occupants.

An arrival during office hours found only one or two of the staff at the ship, because if more were absent from the observatory he would have spoilt the welcome by grumbling about neglect of duty. On these occasions his arrival was speedily known. He walked straight to the study and started to read the top letter of the pile on his desk, but was at once interrupted by the first of a procession of the staff, for each one of whom he had a pithy story of their relatives or friends whom he had seen. A like scene was going on in Lady Gill's room, and before the day was over not only the staff, but every child (many in those days) had trooped in. It was really a family reunion, and one would like to have overheard the expression of his happy feelings at the end of the day.

Another occasion when all hands mustered was "Christmas afternoon on the lawn." The bachelor members of the staff resident in boarding-houses had mid-day dinner with the Chief, all other members with their wives and families kept the afternoon free and

even if on seaside holiday some members of the family returned for the afternoon. The children brought Santa Claus' presents and he took as keen an interest in their explanations as if they were the latest improvement in telescopes. Later followed a meeting of Chief and Staff in his study for a happy hour over pipe and cigar. The youngest and the most boyishly happy of the crowd was Gill. The interest in those engaged at the observatory was not a matter of once a year but was continuous.

On their periodical trips to England they were specially pleased to be used as carriers, and each trip brought a case or cases for some one. The "Messenger" at the Admiralty, who was surprised to see H.M. Astronomer walking in with a box in his arms, would have been more surprised if he had known it was a wreath of Cape flowers for the grave of a junior's relative.—He was proud to deliver it with his own hands.

A packing-case was always kept open at his headquarters for parcels he was to bring out on his return. On one occasion when consulted by a relative of one of his staff commissioned to purchase and send out a piano, he (assured that the relative desired to send a more expensive instrument and was willing to pay the extra cost) offered to select and convey the instrument to the Cape. When payment of freight was tendered by the recipient he was mightily offended.

CHAPTER XIV

CORRESPONDENCE WITH ASTRONOMERS (1884-6)

Mr. Christie—Dr. Huggins—Dr. Gould—Professor Kapteyn—The
Durchmusterung—The astrographic chart.

GILL's gratitude to Mr. Christie for his support when applying for the heliometer was expressed in many letters to astronomers at home and abroad, and was also shown by his letters to him personally.

TO THE ASTRONOMER ROYAL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1884, *November 4.*

MY DEAR CHRISTIE,—I cannot let a mail pass without sending you our most hearty congratulations on the new arrival—and above all on the good news you give of Mrs. Christie. You know that you have our warmest wishes that all good things may fall to your lot. I know the relief of mind that this happy event has brought you. God grant that your dear wife and her boy may long be spared in health and strength.

[Here follow remarks on a paper he is sending for the R.A.S. denouncing with indignation his predecessor's inexactitudes in reducing transit circle observations. And he adds]—

There is no stopping to reason out anything, no care to eliminate or investigate sources of error, but a very common routine mill of a sledge-hammer kind smashing up and grinding together all kinds of incongruities and turning out a certain tale of work, let its quality be what it may.¹

¹ [And yet this, in a less exaggerated form, was the tendency he was constantly deploring in the fundamental meridional work of all modern observatories except, perhaps, Pulkowa.]

I enclose a letter from my wife for Mrs. Christie. I am thankful to say that Mrs. Gill is wonderfully better. She is actually giving a dance to-morrow in honour of my brother [Patrick, from Australia] who is living with us on a visit. I am turned out of my Sanctum, which is to be the ball-room, and I feel very much like a fish out of the water. With hopes of continued good news and kindest regards.—Believe me, Always sincerely yours,

DAVID GILL.

The condemnation, in the above letter, of the methods of observation and reduction used in Stone's valuable Catalogue of Southern Stars emphasizes the position always held by David Gill that nothing but the best achievement should be tolerated by a real astronomer. Right or wrong, that was the key to the man's life. He looked upon all "slapdash" methods as treason to the "Queen of the Sciences."

TO THE ASTRONOMER ROYAL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1886, *February 2.*

MY DEAR CHRISTIE,

* * * * *

By last mail I had a letter from Otto Struve to tell me that I have been elected a corresponding member of the Imperial Academy of Sciences, St. Petersburg, the election to be announced at the annual meeting of the Academy on January 10.

* * * * *

Sudden hot weather has set in upon us, and it has upset my wife's health, and she is suffering a good deal. I hear you are being frozen while we are being roasted. What would I give now for a snowball fight, or a pair of skates and a bit of good ice! and probably you would give something for some of our sunshine and heat! So it goes. However I am as busy as I can be, and consequently quite happy and ready to make the best of things.—Always sincerely yours,

DAVID GILL.

TO THE ASTRONOMER ROYAL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1886, *April 7.*

MY DEAR CHRISTIE,

* * * * *

You are a dreadfully bad correspondent. You don't know how grateful a letter is at this distance from home, especially about matters astronomical, else you would write me oftener.—Yours sincerely, DAVID GILL.

TO THE ASTRONOMER ROYAL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1886, *November 29.*

MY DEAR CHRISTIE,—I was prepared for the news¹ conveyed by your letter of Nov. 4 by a telegram from Huggins.

There is only one view of the question to which I can take exception and it is this, viz. that the Gov^t Grant Committee having voted £100 for a new Dallmeyer lens, and having induced me to spend Nasmyth's £200 and £50 out of my own pocket for the apparatus represented in the enclosed photograph, to carry out a scheme which they had so far supported, suddenly turn round and throw upon me the responsibility of dispensing with Mr. Woods' services now, and thus upsetting the whole carefully organized existing work, or taking upon myself the risk of having to pay his expenses to England out of my own pocket. Indeed in any case the responsibility for these expenses is thrown on me, as Mr. Woods cannot be dismissed without six months notice, and an adverse decision in May will cost me thus 12 months pay besides Woods' passage home, a matter of £200.

I need hardly tell you that I prefer to undertake this responsibility to breaking up the existing work.

* * * * *

It may be well at this stage to give a few characteristic letters of this period to other astronomers.

Gill's voluminous correspondence with Huggins is mostly of interest only to practical astronomers. But his

¹ [That the Royal Society might discontinue financial support to the C.P.D.]

racy style crops out everywhere. Here are some extracts from letters written in 1886 from Gill to Huggins.

The famous recipe for making hare soup says, "first catch your hare." Just now I am catching my hares, and hope in due time to make a quantity of soup in England.

But I wish to present the opportunity to you of coming out here yourself and Mrs. Huggins in September to try y^r own hand at photographing the Moon on the background of the Corona. . . ., and you and your wife would have a home and a right kindly welcome.

I have a very kindly feeling to Pritchard. I remember long ago his wise advice to me, at a B.A. meeting in Edinburgh when I rushed like a hot-headed young ass as I was, at conclusions about the parallax of a nebula founded on a few observations extending over a few months. How wisely he advised me to be cautious and patient, but no—I *would* make an ass of myself. Well! that taught me a lesson, and I wonder chiefly now how it is that a man can be so wise in advice, and so foolish in practice as Pritchard seems to have been.

TO DR. B. A. GOULD (Cordoba)

1884, *December 23.*

MY DEAR GOULD,—It is a long time since I have written to you, but I cannot allow a single mail to pass without acknowledging receipt of your Zone-Catalogue.

I have no adequate words to describe such a work, and one cannot think of it alone without the Uranometria and the Catalogue on which it rests.

The whole history of practical astronomy presents no such brilliant instance of successful devotion to a well conceived original design, carried out from first to last with consummate energy and skill. You have compelled by your enthusiasm the Government of a remote Republic to make large sacrifices for science, you have won the devotion of your assistants and inspired them with some of your own fire, and the result is incomparably the most precious contribution to the astronomy of the Southern Hemisphere, and one of the noblest works ever accomplished by the labour of a single Astronomer.

With all my heart I am in sympathy with the dedication of this work to the memory of your wife. Without

sympathy and co-operation like hers few men would voluntarily have endured the expatriation and solitude of a life like yours—without his wife's fullest co-operation no married man had a right to do so—and none but a married man with such a wife as yours could have done it.

I would that she had lived to see this great work finished, and to have shared with you the honours and congratulations with which your work will be received. The reward of sacrifice in a noble cause is not only the honour and the praise of men in the accomplishment of the work. It is a higher and a nobler and a better thing, it accompanies the work from day to day; it is the purifying and refining of the aspirations, the daily increasing desire for higher and better things, the fitting of ourselves daily for the higher and the better of the hereafter.

Those who, like your wife, have led a life of sacrifice for the high, the noble, the pure, the true, have found no small reward already in this life, and now, as I believe, her soul waits for perfecting with yours the ever higher life of the eternities.

May God bless and help you in your more solitary life. May her children bless you, may your work which she shared continue to fill your useful life, and may the hope of meeting comfort you "till the day breaks."

My heart is too full of you and yours to write about my own little affairs.

My wife joins me in kindest regards and sympathy, and Believe me, Always sincerely yours,

DAVID GILL.

TO THE BROTHERS HENRY (Paris)

1885, *May 13*.

MY DEAR SIRs,—I am sorry to say that from a telegram which I have just received I fear it will not be possible to obtain the necessary credit for the photographic telescope—beyond the Dallmeyer lens with which I am now carrying on the star charting of the Southern Hemisphere.

I had hoped to be able to carry on simultaneously photographs of star clusters, etc., with sufficient precision for accurate measurement—but this must wait. It is very sad that science should have to wait for money—but so it is—alas!—Yours very sincerely,

DAVID GILL.

After many preparations the first exposure of a Durchmusterung plate with the improved apparatus was made on April 15, 1885, and the exposures were completed in December 1889.

The labours of our astronomer were by this time so exacting that the amount of work required for measuring star places upon the plates fairly appalled him, although never in his life did he flinch from a duty. At this time one of the most delightful episodes of his life occurred. He was in continual correspondence with the greatest authorities in Europe and America on particular lines of research on which he was, or expected to be, engaged. Thus for some years he had kept up a correspondence concerning the highest refinements possible, in certain directions¹—for the avoidance of all possible errors in astronomical fundamental measurements of position—with a Dutch astronomer whom he had never met, Professor J. C. Kapteyn, then of Leiden, afterwards of Groningen, who became later the highest authority on stellar motion investigations.

Kapteyn was well qualified to appreciate the crying need of a southern Durchmusterung in continuation of the invaluable catalogue of Argelander. Imagine, then, the joy of the harassed astronomer at the Cape to receive, in December 1885, a letter from Professor Kapteyn containing these words—

PROFESSOR KAPTEYN TO DR. GILL

16 Dec. 1885. [Conclusion of letter.] I am here to break off because I now hear that this letter has to be dispatched an hour earlier than I expected.

I therefore will write you another letter that will reach you a week later. In that letter I will make bold to make and explain to you a proposal that I hope you will not deem indelicate. It is in the main what follows.

¹ See *Copernicus*, vol. iii. for Professor Kapteyn's method for getting fundamental declinations and latitude and for correcting refraction tables. Gill was practically carrying out Kapteyn's scheme.

If you will confide to me one or two of the negatives I will try my hand at them, and if the result proves as I expect I would gladly devote some years of my life to this work which would disburden you a little as I hope and by which I would gain the honour of associating my name to one of the grandest undertakings of our time.

Afterwards Kapteyn wrote: "I think my enthusiasm for the matter will be equal to (say) six or seven years of such work."

Sir David Gill has tried to express the sensation of relief afforded by this confidence shown towards him by that distinguished astronomer.

At a time of great stress and discouragement he [Kapteyn] lifted from my shoulders a load of responsibility by his noble and spontaneous offer to undertake the measurement of the plates, the computation of the results, and the formation of the catalogue.

The whole of Kapteyn's work is marked by extraordinary thoroughness and accuracy; and the time he spent on the C.P.D.¹ and the revision of it was double the number of years he had estimated. When two such earnest fellow-workers are in harness together, each one is amply repaid for his own share by the affectionate esteem established between the pair. But Gill, while he regretted his inability to repay in an equal degree the self-sacrifice of his colleague, was rejoiced to find that there was some recompense, and that this work upon the C.P.D. first directed Kapteyn's mind to the study of cosmical astronomy, and "led him to the brilliant researches and discoveries with which his name is now and ever will be associated" (*History, etc.*).

Kapteyn's greatest discovery in cosmical astronomy was told to the world, first at St. Louis in 1904, and then at the Cape in 1905 during the visit of the British Association to South Africa. This discovery was that the great

¹ Cape Photographic Durchmusterung.



PROFESSOR KAPTEYN.

To face page 168.

majority of stars, near enough to us to show proper motion, are moving in two great swarms in nearly opposite directions. It is not too much to say that this great discovery has revolutionized our conceptions of the stellar universe.

Their combined work riveted these two men together in other researches, and Kapteyn's name was thereafter added to that growing band of distinguished astronomers whose continuous correspondence with Gill became an important part of the world's progress in astronomy.

Meanwhile, the period, from 1884 to 1887, of absence from England was being utilized in Europe. Gill's communication to Admiral Mouchez, head of the Paris Observatory, about the photographs of the comet of 1882,¹ led him to organize an International Conference of Astronomers to meet in Paris in 1887. As already stated, an inspection of these photographs had attracted the attention of the Brothers Henry of the Paris Observatory. They were then engaged in revising Chacornac's catalogue of zodiacal stars, in which work they had just reached the appalling mazes of the Milky Way. They immediately understood that the assistance of photography must be brought to bear upon the task; and Admiral Mouchez, having been equally impressed by Gill's photographic work, gave his official support to the Brothers Henry. These devoted brothers then set to work, with their own hands, to make the lenses for, and to mount, a fine photographic telescope with which they produced superb photographs which delighted the astronomical world.

Following from these events, Admiral Mouchez, with the assistance of Dr. Gill and the brothers Henry, was able to invite the astronomical world to Paris for the year 1887, to discuss the possibility of executing an International *Carte du Ciel* by photography.

¹ *Comptes Rendus de L'Acad. des Sciences*. Paris, 1882, December 26, vol. xcv. pp. 1342, 1343.

CHAPTER XV

SECOND VISIT TO ENGLAND (1887)

The Heliumeter—The Paris Congress—The Cape Durchmusterung
—An unappreciative colleague—Admiral Wharton—Situation
saved.

IN 1887, Dr. Gill had to return to Europe partly to join in the deliberations of the Astrographic Congress at Paris, and partly to receive from Repsold of Hamburg the fine heliometer, due in February, to the performances of which he looked forward with enthusiastic hopes. He was also anxious to see whether the resolution of the Government Grant Committee of the Royal Society, to withhold financial support from the C.P.D., was to be carried out. The Committee, on the suggestion of Dr. Huggins, had decided to postpone a final decision until after the Paris Congress.

This visit, in 1887, to Europe was most eventful for astronomy. It would have been so had nothing come of it except the inspection and delivery of the great 7-inch heliometer for the Cape Observatory, which was destined, in the hands of probably the finest observer in the world, to furnish results of unparalleled accuracy in problems beyond the capacity of most observers.

It would have been equally eventful for astronomy if nothing had come of it except the Astrographic Congress, with the initiation of the International *Carte du Ciel* and Catalogue. David Gill was elected its *Président d'honneur*, acclaimed by ballot, and he proved himself in the sequel to be the greatest organizer of astronomical joint undertakings known to his generation.

His most enjoyable episodes were the tour of foreign observatories, when he first had the pleasure of meeting his fellow-worker, Professor Kapteyn; and the visit with him to Hamburg for the inspection of the great heliometer.

Professor Kapteyn, in his obituary notice of Sir David Gill,¹ tells us—

In March 1887 I had the pleasure of accompanying him to Hamburg. After a fatiguing journey we arrived only a little before midnight. Repsold was there to meet us. He told us that early on the next morning everything would be in order, so that Gill might inspect the 7-inch heliometer which had just been completed. Gill would not hear of such a thing. "I can but give you the time necessary for reading my letter. After that we *must* see the heliometer." And we saw it, and when he had inspected every detail, turned every handle, read every microscope, he burst out: "Well, aren't you jealous? Why, I wouldn't be half as happy as I am, if you weren't." Not many weeks later the instrument was mounted at the Cape, the most efficient instrument of the sort in existence.

Having inspected and passed the heliometer, the next holiday work was to go to Paris to meet the astronomers.

At the Astrographic Congress of 1887 the heads of the world's greatest observatories combined to arrange for setting up astrographic telescopes and taking the photographs necessary, each for the portion of the heavens assigned to it. This generally involved application to the Government concerned, for a grant of money. A permanent committee was appointed. It was resolved to add to the actual chart of stars down to 14th magnitude a catalogue of all stars down to the 11th magnitude. It was also resolved to request Dr. Gill to prepare a draft scheme for carrying out the decisions of the Congress, as a basis for discussion. Gill foresaw in this great

¹ *The Astrophysical Journal*, September 1914.

catalogue a work of incalculable value to future astronomy. His desire to benefit astronomers of the future, in the way that Bradley, by his extremely accurate work more than 150 years ago is benefiting us, was well shown in the course of a letter to the Secretary of the R.A.S., in the following year.

TO E. B. KNOBEL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
April 26, 1888.

MY DEAR KNOBEL,—

* * * * *

You lay down at the end of your letter a statement with which I find it difficult to agree, and one which I venture to hope you will reconsider, viz. "there is an obvious objection to embarking in a scheme which cannot be completed for thirty years from now."—I should be as sorry as you if we did not get the photographs taken within the next 5 or 6 years. It is most desirable that we should have the *data* for determining the places of the stars as nearly as possible at one epoch for the whole sky. But these mere photographs are of very little real value in themselves except for very secondary purposes—and to carry out the resolution of the Congress and catalogue the stars to 11th magnitude is a great and noble work that may worthily occupy 30 years—and I would be very glad if I could be sure that it would be completed in that time.

* * * * *

Always sincerely yours,

DAVID GILL.

These high ideals concerning the assistance that all true astronomers can, and ought to, give to their successors, and concerning the unselfishness with which the true astronomer must do his duty, not to himself and his own generation alone, but also to the science of astronomy, were the motive impulses which guided all of David Gill's astronomical thoughts and deeds. Thus in his presidential address to the British Association in 1907 he speaks of learning the lesson—

that human knowledge in the slowly developing phenomena of sidereal astronomy must be content to progress by the accumulating labours of successive generations of men; that progress will be measured for generations yet to come more by the amount of honest, well-directed, and systematically discussed observation than by the most brilliant speculation; and that, in observation, concentrated systematic effort on a special thoughtfully selected problem will be of more avail than the most brilliant but disconnected work.

By these means we shall learn more and more of the wonders that surround us, and recognize our limitations when measurement and facts fail us.

In regard to the astrographic chart and catalogue, there was some controversy after the Paris meeting. It is not the duty of this biographer here to argue as to Dr. Gill's rightness or wrongness in striving towards the very best, when the very best may be unattainable. Nor is it his duty here to argue for or against the preliminary modes of procedure proposed by Dr. Gill, nor to applaud or criticize the plans and the instruments devised by him for their execution. Subsequent historians of astronomy will be in a better position for dealing with these questions.

It will be enough here to have narrated briefly the part which fate, in the shape of fifty-six astronomers, compelled this essentially modest man to play in the Congress of 1887, as the leader and organizer of the grandest international astronomical research that has ever been undertaken. He did not seek that position for himself, but, in the words of one writing from the trenches in France, 1916—

“The wise man will take the lowest room; but only the shirker will refuse to go up higher.”¹

Gill was never known to refuse to undertake any duty imposed upon him.

When, as one of fifty-six astronomers, he set out in 1887 for the Congress at Paris, he looked upon himself as a

¹ *The Spectator*, January 29, 1916.

unit among fifty-six units, every one of whom would come to the meetings primed with useful plans, the result of mature thought. He little realized at first, what soon became apparent to others, that he was head and shoulders above all the others in knowledge and experience of the production and measurement of stellar photographs, and in consideration of the problems; and that from this year, 1887, to the year of his death, 1914, the members of the *Comité permanent* would, individually and collectively, seek to be guided and directed by his judgment, as in nearly every point they so succeeded, towards the completion of the *Astrographic Chart and Catalogue*. One of the ablest of the members of the *Comité permanent* has expressed this in the following words ¹—

The initiative for this great undertaking is due to the joint action of Gill and Admiral Mouchez, the director of the Paris Observatory, aided by the brothers Henry. What the whole undertaking, not only at starting, but during the whole of its progress, owes to Gill's untiring energy, all will know who attended the meetings of the *Comité Permanent*. Up to the last his was the great driving force. . . .

How different everything will be at the future meetings, when Gill will not be there! How different would be the outlook now, if he could have carried through his plan for a central bureau, perhaps the only important measure which he failed to see brought about!

A few pages may now be given to the Cape Photographic Durchmusterung (C.P.D.), whose fate hung in the balance. The great astronomers of all countries saw the immediate need and great importance of thus extending that invaluable star catalogue of Argelander and Schönfeldt, the Bonn Durchmusterung (B.D.), to the south pole of the heavens. Unfortunately, the occupant of Airy's chair does not appear to have

¹ *The Astrographic Journal*, September 1914.

absorbed his predecessor's sympathetic appreciation for worthy effort outside of his own departments; and he considered it to be his duty to prevent the Royal Society from continuing to support Gill's photographic *Durchmusterung*.

The plates were to be exposed so as to include all stars down to the $9\frac{1}{2}$ magnitude and no more. It would be laughable if it were not almost tragic to record the fact that Gill's work was opposed because, at a Royal Society *conversazione* in 1886, his photographs, showing so few stars, were placed beside long-exposure photographs of the Milky Way, showing thousands of stars. Gill wrote to Newcomb—

I told them that I had heard of babies crying for the moon—but I had never dreamt of anything so funny as a row of Fellows of the Royal Society insisting on having more $9\frac{1}{2}$ magnitude stars in the heavens, else they would stop supplies. This made them very angry.

This ridiculous comparison, and the contention that the immediate completion of Argelander's identification-catalogue would be a competitor, instead of an assistance, to the international *Carte du Ciel* then contemplated, were reasons given by Mr. Christie and his followers for stopping supplies.

In this he was successful. First, at Paris, he prevented the Congress of astronomers from expressing their opinion by saying he would withdraw his official support from the *Carte du Ciel* if the motion proposed by Struve and Auwers in favour of Gill's work were brought forward. Then, at the Grants Committee of the Royal Society, his official position enabled him to overpower the opinions of greater men on the Council whose speciality was not astronomy. There came an earnest appeal on behalf of the C.P.D. from Auwers, and then a most generous offer from the Berlin Academy of Sciences to supply the funds for Gill's great work. This

was countered by the plea that the Admiralty could not be so unpatriotic as to allow him to accept it.

The shipwreck of the great southern catalogue seemed at last to be complete. But people had still something to learn about the unselfishness of David Gill, and of his wife, when the interests of science were at stake. Rather than allow this great need of astronomy to remain unfulfilled they resolved to complete the work at their own private expense.

The following extracts from a letter express the opinion of one of the most distinguished astronomers of the day, Professor J. C. Adams.

TO PROFESSOR KAPTEYN. London 1887. June 5.—Last Friday evening I delivered a lecture at the Royal Institution on the subject of the Applications of Photography in Astronomy—and laid down my views of the Paris Congress and of the relations of the *Durchmusterung* to the work of that Congress.

It was an abominably wet night but the room was crowded, and after the lecture who should come up to me but Prof. J. C. Adams of Cambridge. "I have come up from Cambridge to hear your lecture," he said, "and I am delighted to have done so—good night."

That was all that he said.

But yesterday was the visitation of the Greenwich Observatory, and I went there like all the rest of the world. The Board of Visitors as you know sit down about 3 o'clock, and are generally done with their work at half-past four. But 5 o'clock came, half-past five, six o'clock, and still the Board sat. About 5.30 Pritchard came out looking very angry. I said to him, "What is the matter?"—"Oh, it's Adams. He doesn't understand photography and he has been making no end of trouble," and off he went in a hurry.

At last about half-past six, the Members of the Board came out and adjourned to dinner. I was seated beside Adams. He then said, "They have been talking all sorts of nonsense in that Board. I had to set them right. They said y^r *Durchmusterung* was a rival scheme to the Paris one and should be stopped. I told them I had heard your lecture last night, that it was not a rival

scheme but a necessary preliminary. They thought that photography was to supersede meridian instruments. I told them they were talking nonsense—that they should have come to hear your lecture and they would have been better and wiser men.”

You may imagine what a bombshell this was amongst them.

Then Adams had also come down with Stokes and told Stokes about my lecture and how surprised he had been at my being refused the Gov^t grant. Then Stokes told Adams that both he and Lord Rayleigh thought that Gill was right, but they were overruled by the astronomical members of the Committee.

Any attempt of the enemy to stop me is now fairly checkmated—the work will go on in peace and the Gov^t Grant Committee can weep over their mistake at their leisure.

God grant us health and strength to complete this noble work (as Auwers calls it) and to shame its enemies by its success.

In the course of the same letter to his colleague, Professor Kapteyn, he uses these words—

So, after thinking the matter well over, my wife and I made up our minds that we should spend our own money upon the work, and after reckoning ways and means we found that by a little self-sacrifice we could do so.

And in a subsequent letter to the same friend later from the Cape, dated September 6, 1887, he says—

My wife has gone thoroughly hand in hand with me in the matter. We have carried out a great many domestic economies, and with a little sacrifice of capital we can manage. I shall be truly thankful if in any way we can manage together to do this great and necessary work.

Let it be remembered that this was the wife who, shortly after their marriage, besought him to accept the Dun Echt post, at a great pecuniary sacrifice. In a letter to Miss Agnes Clerke from the Cape, dated December 6, 1887, he incidentally mentions that £350 per

annum was the sum he was then paying out of his own pocket.

It is hardly necessary to add, what is known to everyone, that the *Durchmusterung* has been of the utmost service to astronomers.

Here it ought to be stated that, after the pleasing heliometer incident of 1884, Gill found that Mr. Christie's advice to the Admiralty became decidedly hostile to nearly all proposals issuing from the Cape, and this involved him in tedious correspondence to explain the situation to the Admiralty.¹ To dwell upon this opposition would be to attach undue importance to it. The correspondence is mentioned only because it bears witness to some of the finest traits in Gill's character, and the world's gratitude to him must be increased when it is known that throughout his work for twenty years he had continually to bear the strain of opposition at home in a quarter where least he might have expected it.

Lord Kelvin and others tried at one time, without success, to remove these disabilities. Eventually, the difficulty solved itself to a great extent when Admiral Wharton, the Hydrographer, by his great scientific attainments, was enabled to take upon his own shoulders the responsibility of acting as adviser-in-chief to the Lords Commissioners of the Admiralty, in observatory matters.

¹ The correspondence shows, along with many other similar incidents, that, if Sir W. Christie's advice had prevailed, astronomers would not now possess Gill's and Kapteyn's Catalogue (C.P.D.); the British nation would not have computed and published Gill's final work on Solar Parallax and the Moon's Mass; the splendid Meridian Marks for his Transit Circle would not have been constructed, and some of Gill's and Hough's work would in consequence have been lost to the world; the staff and equipment of the Cape Observatory would have been seriously crippled; and the Observatory itself would have been transferred from the control of the Admiralty to that of the Cape Colony, with disastrous results.—The reader will find some slight mention of these matters in the correspondence with Newcomb, Kapteyn and Miss Clerke, at the end of this book, but the main letters dealing with this and other matter of the same kind are not needed for the purposes of these Memories.

The correspondence between Sir David Gill and Admiral Wharton breathes mutual admiration and trust, with wise counsel gratefully acknowledged. It helped on the cause of astronomy from 1885 to 1905, and enabled Sir William Wharton effectively to support the greatest of Gill's endeavours in the cause of astronomy. No history of astronomy will be complete that fails to record the debt owed by that science to Admiral Sir William Wharton.

The correspondence is too technical for this book. Throughout, it bears witness, in the conflict with Greenwich, to—

Gill's *impersonality* in controversy; his *clearness* of reasoning; his *patience* under misrepresentation; his *persistence* in holding to the point; his *gratitude* to Wharton for supporting the claims of science at the Admiralty, and to the Lords of the Admiralty for their support at the Treasury.

Sir David Gill's relations with the Admiralty officials were always most cordial. Sir Richard Awdry, K.C.B., who came into intimate contact with him while he was the Accountant-General of the Navy, puts the case in a nutshell: "Gill overcame officialdom by the force of his energy and by the honesty of his purpose."

The unofficial and official correspondence with Wharton is so brilliant, effective and instructive that (perhaps fifty years hence) it ought to be published. Here are a few terse examples of style.

FROM WHARTON. 1885, *April* 24.—I quite agree with you in theory as to the duty of all to strive after perfection, but I think you will find that in practice this is very hard to obtain when it involves much expenditure where a Gov^t office is concerned.

TO WHARTON. 1885, *July* 29.—I have not been diplomatic, but I have been honest.

FROM WHARTON. 1890, *October* 31.—Looking back to what you have obtained since you started, I do not think

you have by any means reason to be downhearted at y^r achievements.

FROM WHARTON. 1893, *July* 6.—I am sorry for y^r Library. The Financial Secretary struck it out. You must fight again. If you get it you are lucky. You sh^d see the Admiralty library!!! [He did fight, and did get it.]

TO WHARTON. 1893, *November* 15.—I fully appreciate the real kindness of y^r letter, but I cannot say with truth that I can follow the good advice you give.

FROM WHARTON. 1894, *June* 14.—The Admiralty have been fighting hard for you, and have written stronger letters than I ever saw to the Treasury.

TO WHARTON. 1901, *July* 9.—I am glad to say that I have never yet made a proposal to the Admiralty which has not sooner or later been adopted, in every case with success; nor have I ever wasted public money.

CHAPTER XVI

WORK WITH THE GREAT HELIOMETER (1887-90)

Stellar parallax—the Sun's mean distance—Splendid work—Dr. Auwers' visit — Laborious reductions — Co-operation by foreign astronomers.

GILL's third voyage to the Cape, in 1887, must have been a relief and rest after the turmoil of opposition he had gone through, and an occasion of pleasing rumination on things accomplished, combined with joyful anticipation of great results. He must have felt very happy in knowing that he had with him, on board the same ship, not only the wife who was ever such a support in bright or in dark times, but also that loved heliometer for which he had so striven, with whose aid he might hope to accomplish so much. But a retrospect of his labours at Paris, and the position assigned to him in the great astrographic work, by the unanimous acclamation of all those true men whose opinions he valued, must have given him a new sense of responsibility, and a new feeling of power to do great service to his beloved science.

In the breezy air of the Atlantic, and the clear breath of the trade-winds, all the petty onslaughts of men whose names would be forgotten in a generation must have seemed paltry; for they had not interrupted his work, and had incidentally revealed to him the strenuous support which he might always expect from the really great men like Adams, Stokes, Rayleigh, Struve, Kapteyn and Auwers, who had in this matter been active in helping him.

After Gill's return to the Cape in 1887 the Photographic Durchmusterung progressed splendidly. He had some difficulty in getting the Admiralty to sanction the greater astrographic telescope, and a suitable observatory for it, with which to do his part in the International chart. Meanwhile the new heliometer was set to work upon star distances until, in the years 1888-9, it could be used on the minor planets, Iris, Victoria and Sappho, so as to settle finally the problem of the sun's mean distance. These years were perhaps the most fruitful for astronomy in the whole of his life.

The result of the great Paris Congress laid much responsibility upon Gill's shoulders. His labours, assisted by discussion with Kapteyn, and those of Admiral Mouchez, were much impeded by a few critics, ready to find fault with anything proposed, and unable to suggest any better course of action. This hostility, coming from men who might have helped, was, of course, easily overcome, but was unpleasant to any one devoted to the interests of true science, and led the layman in astonishment to exclaim with Virgil—

"Tanæne animis cœlestibus iræ!"

The more serious trouble was with the Admiralty in getting the photographic telescopes, with suitable observatories, for Greenwich and the Cape, to take part in the great astrographic work. It demanded unceasing attention and correspondence. Often he became despondent when the officials six thousand miles away were stupid and made needless difficulties, or were badly advised.

In the end he got his way as usual, as is concisely stated in the following letter—

TO MR. E. B. KNOBEL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
August 22, 1888.

MY DEAR KNOBEL,—Two days ago I received the following telegram—

"Admiralty London to Astronomer Cape Town. Telescope will be ordered in England. Financial details mailed. Send specification Dome and square building."

* * * * *

But that is a matter of no consequence now. [Certain disputes.] The great thing is that the Telescopes [at Greenwich and the Cape] are sanctioned. . . .

But it is such a pity to quarrel. Let us rather work. There is so much to be done and so much to be thought out, and there appear to be so few who are working and thinking.—Always sincerely yours, DAVID GILL.

Certainly Gill was doing plenty of working and thinking in the cause, as is shown by a mass of correspondence on all sorts of details. The *réseau* which he had invented for measuring photographs in the Dun Echt expedition to Mauritius proved to be a most valuable accessory, not only for certifying all absence of shrinking in the films, but also for facilitating the measurement of star positions on the plate with the help of a machine he devised.

Gill's perseverance in overcoming the difficulties in securing the astrographic telescope are told in a letter to Mr. Knobel. There was no scientific man in England more esteemed than Sir George Gabriel Stokes, and Gill never appealed to him for assistance in a righteous cause without success.

TO E. B. KNOBEL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1888, *October* 13.

MY DEAR KNOBEL, . . . —As I told you before, I wrote to Stokes on July 18 a very urgent letter, begging him as Pres. of the R.S., and as a Member of Parliament, to press the matter on Govt.—either on ministers personally, or if that failed by asking a question in the House.

I understand that Stokes and Grubb got Sir H. Roscoe to ask the question on 31st July. . . .

So soon as Stokes got my letter he went to the Admiralty; got hold of Lord George [Hamilton] and Smith [W. H. Smith] and Goschen, and Underhill

(Ass^t. hydrographer) writes me that but for Stokes' activity and persistence we would not have got the money for months.

As it is I have got now formal official authority for—

£2000 for telescope.

700 observatory and dome.

250 a year for 5 years for skilled photographer.

50 a year for computer to aid in exposing plates.

50 a year for chemicals.

This is £500 more than I asked for—and, strangely enough, my original proposal (at some mischievous suggestion) was condemned as too costly, and I was warned “of the costly character of all proposals emanating from the Cape, and to show more care in future.” This, as you may suppose, roused me, and I showed that the plan of observatory proposed in lieu of mine would cost nearly as much as mine—that the simultaneous view of the zenith by the guiding and photo-telescopes was cut off for 20° or 30° by the proposed segmental opening, and no developing-room and photo store was provided as in mine, and that the plan of paying computers at so much a plate to do the work would not do here.—I then demanded that my Lords should, for my future guidance, point out *any* proposal of mine which had been unduly costly—*any* proposal which had not been successful when carried out, or not well considered before being proposed.

I have no reply to these questions, but my square 20 foot observatory, my skilled photographer and everything I asked for have been granted, and £500 to cover contingencies—(which I did not ask for).¹ . . .

Yes, *The Observatory* has made itself ridiculous, but I think Common and Turner meant well—and no harm has been done to any one but themselves. Bakhuyzen writes me expressing his disgust at the tone of the letters of the Editors and Common, and says “what a contrast to the perfect gentleman Knobel.” Others write in similar terms.

What a splendid offer Lord Crawford has made to

¹ [This is only *one* example out of many where Gill was worried almost to death by stupidity, as well as by misrepresentation, at home. It is also *one* example of the way in which, by holding to his point, he, almost invariably, gained the wholehearted support of the Admiralty to his well-considered recommendations.]

Edinburgh¹—I only regret that such fine instruments should be condemned to use in such a climate. . . .

Miss Clerke² is here, very happy and very busy with star spectra. . . .

Very busy just now with Iris—2 to 4 a.m.—Always dear Knobel, Yours sincerely,

DAVID GILL.

TO DR. COPELAND

February 13, 1889.

MY DEAR COPELAND,—I have been inordinately busy for the past month or two, and have each mail-day postponed writing to you, because I said to myself I can write more at length next mail. But my letter has been too long postponed now, and must wait no longer.

Therefore believe me and indeed you know right well—that it is no lack of cordiality or good will that has delayed the congratulations on your app^t to Edinburgh which I wd now send to you. You will have a most desirable position in every way—except perhaps in clearness of sky—the most delightful society—and an equipment second to none in Great Britain.

It is indeed a noble gift of Lord Crawford's to the Scottish nation—and I am sure that in your hands the outcome will be much good solid work for the advancement of Astronomy.

What is your staff to be?—what the general plan of the buildings?—what instruments are to be mounted? In all these things I take the very deepest interest, and any information about them would be most welcome.

I can hardly think without a sigh of those foundations at Dun Echt which I laboured to make so satisfactory and sound—all swept away—and yet I am sure it is for the best interests of science that it sh^d be so. You have a grand chance, with all y^r experience, to plan a splendid observatory—and I am sure you will. If any ideas of mine are likely to be useful to you—by all means command me.

I do not know whether you are still at Dun Echt or

¹ Referring to Lord Crawford's presentation to the nation of the astronomical instruments and valuable library at Dun Echt, now in use at Blackford Hill, Edinburgh.

² The celebrated authoress of historical books on astronomy. She paid a long visit to the Gills, and received much encouragement in her work.

what or how?—but no doubt this will find you if addressed to Edinburgh.

Here we are as busy as you must be—finishing off the reductions of the last 5 years field work of the Geodetic Survey—building the new Photographic Observatory—reductions of observations of Iris—observations on Stellar parallax every night with Heliometer—and every day an hour and a half at its division errors—finishing up the Photo. Durchmusterung—and the regular tale of Meridian work. All my computers are drifting off to the Gold fields. I think I must get out some young German Astronomers—do you know any who would come?

You will find delightful colleagues in Tait, Chrystal and Crum Brown—and a very true friend in Lord Maclaren—It is such society that one misses here—and which you must have missed at Dun Echt.

I am getting more and more attached to this place. It has a glorious climate, presents splendid opportunities for work, and a beautiful home is growing around us.

The grounds which used to be a ghastly wilderness are now at least tidy—and are certainly picturesque. Drainage, road-making, tree-planting, water supply have done wonders.

We have ten times as much Society as we can deal with—and can have as much of it or as little of it as we please.—Only we have no Tait or Chrystals or Lord Maclarens or Robertson Smiths—that is what one misses. But we have had Miss Clerke—and half expect a visit from Auwers in June—and that is for the time ample compensation. Mouchez wants me to come for the next meeting of the Permanent Committee of the Paris Astro-photo. Congress—but it is impossible as I am to observe Victoria and Sappho in conjunction with the Heliometers at Yale, Bamberg, Gottingen and Leipzig. I have urged that 1890—(after we have got and tested our telescopes) is the time for the Congress and he agrees that the really important meeting will be then—and to that I will come. My wife desires to join in kindest remembrances to Mrs. Copeland and y^rself.—Always dear Copeland, Sincerely y^r^s

DAVID GILL.

Next to his wife Gill loved his heliometer. It is somewhat remarkable that Lady Gill was never jealous

either of the telescope at Skene Terrace, Aberdeen, or of the heliometer at Ascension or the Cape. When he set up the great heliometer at the Cape and remembered all he had gone through to perfect it and to acquire it, and when he first tried it upon star measurements and found it to be "the most powerful and convenient instrument for refined micrometric research in existence" [*History, etc.*, p. cxlviii], he must indeed have felt the satisfaction of a creator in seeing that *it was very good*. And when on subsequent nights he spent a few hours with this second love, in getting the data for measuring star-distances, he would come into the house shouting and singing; so that his wife then said he was "daft."

When David comes in after a night's work with his old heliometer he is just daft, laughing and joking.—He was the same with the telescope in his father's garden when we were first married. So it was at Dun Echt, and exactly the same in Ascension.—And so it will be as long as his eye can look through a telescope.

The heliometer was soon set up; and work commenced in the great attack upon star distances with this powerful instrument.

Concerning these researches it is best to quote from Professor Kapteyn's obituary notice of Sir David in 1914.

Twenty-two stars have been measured for parallax, either with the 4-inch or the 7-inch heliometer. They are the only reliable determinations of stellar parallax ever made in the Southern Hemisphere. It might almost be said that they are the first parallaxes, or at least the first extensive series of parallaxes, which command the entire confidence of the astronomers. The gain in probable error may not be so considerable. The gain in real reliability is very great. In fact, in the domain of stellar parallax, as indeed also in that of the solar parallax, Gill has given us back our belief in probable errors, a belief which, among astronomers, had given way to a pretty general scepticism.

Why this is so is not a matter of doubt. No one can

study Gill's work without feeling that he has to do with the born observer, the man with the intuitive faculty of finding out every possible source of systematic error and with the unerring judgment in devising means for its removal; *the man with the instinctive feeling for perfect symmetry by which all errors known or unknown must be eliminated.* As a consequence we find Gill never satisfied with his work, as long as in any part of it the agreement of the several results is markedly inferior to what might be expected from the probable errors. It cannot be doubted that by the example thus given of a perfect arrangement of the observations and their exhaustive discussion, Gill has contributed to the advancement of science quite as much and more than by the results of his observations themselves.

In the years 1887-8, besides all the observations for getting star distances, in which he was assisted by Finlay and the Dutch student De Sitter,¹ there was a stupendous amount of work to be done in preparing the way for obtaining a new and definitive measure of the sun's mean distance by observations of the minor planets Iris in 1888, Victoria and Sappho in 1889. The problem of the solar parallax had been his first great research, a matter of great importance for the lunar theory, and for fixing the correction to star places due to the aberration of light, and he never desisted from efforts to improve its accuracy.

"Nil actum reputans si quid superesset agendum."

In the first volume of *The Observatory*, in 1877, Gill wrote what has been generally admitted to be the best discussion ever written upon methods for determining the solar parallax. He was now about to apply the conclusions therein proclaimed. The arranging and planning of the operations involved a vast amount of preliminary work, calculation and correspondence, to unite in one plan all who were able to lend a helping hand.

It became necessary to know very exactly the positions of the stars of comparison. To enable him to do this

¹ Now Professor de Sitter of Leyden.

in the most complete manner, Gill applied to his " friends," a term which now included every astronomer in the world; and twenty-two observatories were engaged in finding accurate positions of the comparison stars which he selected. Another friend, Auwers of Berlin, undertook the labour of reducing for him all of these observations.

Now he saw that a breakdown, or eye-strain, of a single observer would be fatal, and his assistant, Finlay, had other duties to attend to. No one else at the Cape could use the heliometer. Gill told his trouble to the one of his many friends who was most able to help him. For reply, Dr. Auwers, the great Berlin Astronomer, packed up his portmanteau, gave up all his own work and engagements, and started on a voyage to the Cape to give his personal services as assistant to Dr. Gill in his dilemma.

When Gill suggested this visit to Auwers he wrote thus—

TO A. AUWERS.

One observer cannot possibly accomplish all the work here—and if you neglect such a chance as this I shall think that my good friend has lost all his old astronomical enthusiasm!!! Come—good friend—come.

FROM A. AUWERS

BERLIN, *April 23, 1889.*

MY DEAR GILL,—I am ready to leave this April 29 and to sail from Southampton (p. *Spartan*) May 3rd. So I hope to meet you May 23 and to begin observing with the heliometer the same or next evening.

* * * * *

Always yours most sincerely,

A. AUWERS.

The four months spent by Dr. Auwers at the Cape gave unalloyed happiness to guest and hosts alike. The mutual esteem of these two indefatigable workers, and the interchange of astronomical experiences, gave to

each an intellectual treat of the highest kind. Their work with the heliometer was entirely satisfactory. After completing the Victoria observations the two astronomers visited, for relaxation, the beautiful districts of Ceres, Wellington and Cape Point; and the parting in September was heartrending.

FROM A. AUWERS

September 17, 1889.

MY DEAREST GILL,—To-morrow morning we expect to reach Madeira. [Here follows a description of the voyage.] My head becomes too giddy in the close saloon to write you more, and to express to you so as I should like, how happy and thankful I continue to feel, and always shall be, on behalf of all friendship and kindness bestowed upon me by you and your wife during these beautiful months. I hope to hear from you very soon, and hope to hear only good news—that both of you are well, that the triangulation has made satisfactory progress, and that Sappho is not too faint, and Mrs. Gill not too anxious about the state of the sky, and that you both still miss me a little, and think of me nearly so often and so friendly as I do of you.—Yours most truly, A. AUWERS.

It is only by reading the *Cape Annals* that astronomers can learn what a huge undertaking was involved for the observations on these three planets, and still more for their reduction. It will be noticed that everything depended upon the exact position in space of each observer at the time of his observations. And his position is affected by (1) the rotation of the earth on its axis, (2) its course round the sun affected by planetary perturbations, and (3) by the same as affected by the moon's attraction. This last depends upon the true mass of the moon. It is a most striking commentary upon the precision of these investigations that Gill was able to detect periodical irregularities in his results due to the fact that the accepted mass of the moon was wrong. It was only by choosing a new value for the moon's mass that these irregularities could be eliminated. Thus by three months



[To face page 190.]

THE HELIOMETER HOUSE, WITH DR. AUWERS AND
DR. AND MRS. GILL.

of observations on Victoria with the extraordinary exactness of his methods he enabled us to measure the deflection of the earth in her orbit by the moon more accurately than could be done by all the solar observations of a century collected by Le Verrier for use in computing his Tables.

As a matter of fact, this final check upon the results could not be effected with the planetary tables computed for the Nautical Almanac, where 7-figure logarithms only were used. So Dr. Tietjen of the Berlin Nautical Almanac Office undertook to recalculate these tables for Gill with 8-figure logarithms, taking note of all planetary perturbations.

This discovery of an error in the accepted value of the moon's mass, and of its effect upon the earth's position, is delightfully told in a letter to Newcomb, with whom he discussed every step in this great work.

TO PROFESSOR NEWCOMB

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1892, *December 13.*

MY DEAR NEWCOMB,

* * * * *

But now let me go into a matter that has stirred me to the depths, and which I think will stir you also.

You will remember that I divided the Victoria obs^{ns} into 15 groups. . . .

When the first two or three groups were solved I was a little melancholy at the way in which the values of the resulting Δa (or x 's) came out—however, light very soon came out of the darkness.

When I proceeded to plot the Δa 's on a piece of paper I was astonished to find that *every one* dropped into a regular curve, and as group after group came out every value of Δa dropped within 0".03 or 0".04 of the same curve. And not only that but the Declinations have a smaller curve of the same period, and not only that but the maximum and the minimum of both curves will tell you almost to a day when the moon's longitude is 90° from that of the planet—and in fact you have the curve of the lunar equation !!

Gill then remarked that his Mars observations at Ascension in 1877 showed the same periodical lunar effect. From this date he never ceased urging upon Newcomb the completion of his new tables of Mars, that he might then use his 1877 observations at Ascension for improving our knowledge of the moon's mass.

The labour involved both in the observations and in the reductions, which latter demanded renewed efforts when the extreme accuracy of the former became apparent, was enormous—the success complete.

So soon as the preliminary reductions demonstrated the unprecedented accuracy of these observations, Gill was urged by astronomers to hasten the complete reduction of the invaluable results obtained by him. Simon Newcomb wrote—

I thought that I was making Astronomical tables for the 20th Century, but you have obtained results for the 21st or 22nd Century.

And Tisserand, Director of the Paris Observatory, wrote, “C'est une véritable triomphe pour l'astronomie de précision.”

Unfortunately, at this period the Admiralty refused for a time the necessary computers, refused even to replace those incidentally lost to the observatory. This was done on the advice of the Astronomer Royal, who considered they ought not to encourage such observations of minor planets as were outside of Greenwich work, nor the reduction of observations many of which were of foreign origin.

TO PROFESSOR NEWCOMB

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1891, January 14.

MY DEAR NEWCOMB,—I am in the midst of a fight with the Admiralty about a proper provision of computers. I have already spent Pickering's (Miss Bruce's) £100 in advance, at least it will be done at the end of

another month, and I am then pushing on the Victoria and Sappho work at my own cost.

This is of course between ourselves.

TO PROFESSOR NEWCOMB

1891, August 26.

MY DEAR NEWCOMB, . . .—I write to tell you—

1st. That y^r kind letters *re* reduction of observations of Victoria and Sappho duly reached me—and were of the greatest service.

The first asking whether it was only money I wanted, and that you c^d probably get that for me, I showed to Lord Herschell the Lord Chancellor of the last Gov^t. He was very indignant about the meanness of the Admiralty and spoke to Mr. Goschen the Chancellor of the Exchequer. Goschen wrote to say that the matter had never gone to the Treasury . . . and Goschen advised L^d Herschell to tell his friend to apply again to the Admiralty. This I did—and y^r semi official letter coming in the nick of time I added it. Three weeks passed without a sign—and L^d Herschell wrote to ask me if I had had no answer—I said none. He wrote, "Shall I go for L^d George Hamilton?" (First Lord of the Admiralty)—I said "go," and he "went." Three days after I got the money.

I have had several similar skirmishes.

There is further correspondence on this subject with Newcomb May 30, 1894. The results obtained from the three planets agreed within their probable error, and confirmed the values yielded by Gill's preliminary attempts in his Juno and Mars expeditions in 1874-5 and 1877-8; and are universally accepted as correct within less than a thousandth part of the amount. His definitive value for the sun's mean distance is 92,876,000 miles.¹

It will be seen from this cursory narrative how cordially the whole world of astronomers were always ready to assist David Gill in his great undertakings, confident that

¹ Corresponding to a horizontal equatorial parallax of 8".802.

his careful preparation and "dogged persistence" would carry the most laborious endeavours to a successful issue. They felt themselves amply rewarded by being enabled to participate in the enterprise, especially when dealing with the planet Victoria, which may be described as one of the grandest astronomical researches ever carried out through the energy of a single dominant personality.

It was Gill's personality that led Elkin first to visit the Cape to use the heliometer, to obtain one at Yale, and to share in Gill's labour—that led Schur and Peters and Hartwig to add their quota of heliometer observations—that led Auwers to reduce for his use the great mass of observations of comparison stars—that led the directors of twenty-two observatories to observe all the comparison stars—that led Dr. Tietjen to compute for him the planetary perturbations. Lastly, it was affectionate esteem that led Auwers to sacrifice everything to lend his personal help. This was the man who, on Gill's death, wrote—

I have lost a really true and dear friend after 40 years of common work in which we always were pleased to join, fully sure that the one could rely upon the other.

We may search the memoirs and biographies of the most esteemed and the best loved astronomers of all times, from Tycho Brahe, Kepler and Newton, to the great days of the Herschels and Struves, of Bradley, Argelander, Adams and Airy, without finding any parallel to this intense confidence, devotion and affection, universally inspired and held, by the simple, unselfish and essentially human character of this great, big-hearted astronomer.

CHAPTER XVII

A VISIT FROM MISS AGNES CLERKE (1887-8)

THE last chapter dealt with star photography and the use of the new heliometer for finding the distances of the sun and stars. In these observations Gill attained to the very zenith of his observing powers. Many years passed before his photographic *Durchmusterung* and his solar parallax work were fully reduced and published. These two publications alone would have laid astronomers under a permanent debt to him. Fortunately, they are only two, out of many, of Gill's contributions to exact science while at the Cape.

It is a pleasure now to be able to give some letters showing another side of the man. They illustrate Gill's keen desire to help any one who sought his advice and introduce us to one of his most esteemed friends, a charming personality, Miss Agnes Clerke, the great historian of nineteenth-century astronomy.

Mrs. Gill had made her acquaintance, and was charmed with her artistic temperament. During their visit to England in 1887 she begged her husband to read Miss Clerke's *History of Astronomy during the Nineteenth Century*, in spite of his belief that no woman could do justice to his noble science. Reluctantly he took up the book. As he read page after page his interest and astonishment grew. After he had read it through he was convinced of the intellectual power and originality of the authoress.

TO MISS AGNES CLERKE

CAPE OF GOOD HOPE, *December 6, 1887.*

MY DEAR MISS CLERKE,—It was *real good* of you to write me ; I cannot tell you how welcome was your letter of October 10, and how still more welcome is the prospect of hearing from you as you can find time. Six thousand miles away from the centres of intellectual life give a value to such letters as yours which you can hardly understand. In fact, it is one of those experiences which it would be worth your while to learn something of. You who write so much to interest astronomers would be able better to understand what they want to hear if, knowing what you do, you were to remove y^rself from the centre of information for a while and come out here, and feel a little of the thirst to know what is going on.

Now you do not say anything about the matter of y^r coming out to see us, which you really seriously entertained, and which my wife and I hope one day ere long to see realized. It would do you a world of good, and me a world of good also, just to have real good talks about all the things you are in the midst of.

This book of yours would, I am sure, have a far higher value if you really practically knew something of practical astronomy, and you should observe a little bit just to be able to write better about things practical. Therefore I beg you very seriously to consider the matter, and try so to arrange your plans and engagements as to allow you to leave London about the first or second week of August next and come out for a month or two to see us. September is the most delightful month of the year, the observatory hill is a carpet of wild flowers, and the weather is simply perfect.

Now for your letter.

The photographic matter on the lines of the Congress stands thus. [Here follow several pages detailing the progress, and want of progress, of the Astrographic chart and catalogue.]

Meanwhile the little *Durchmusterung* is going on apace. Woods is working every night till midnight, and then one of the computers takes up the work of exposing at midnight and goes on till dawn.

The new plates give me the same result in half an

hour that the old plates gave in an hour. Kapteyn is getting on with the reductions, but he has 5 or 6 years' work before him. Still, the work will be out before the other has well begun.

I am very sorry to have missed Young—he is a man I have long wished to know.

Every word about y^r book interests me greatly. Yes, go on to the end before you turn back—that is best—and then rewrite or recast it as necessary. But I think you will find that after you have driven what you have written upon a special subject out of y^r head, and then after a lapse of time turn back, you will be more pleased with what you have written than you were before, and that only where fresh thought or study have put matters in a new light or brought out something you did not know before, then only will you require to alter what was written.

I fear that my mills grind very slowly—and that I shall have very few facts for you—unless you can wait 4 or 5 years, when I hope to have quite a batch. The Helimeter is erected and the trying work of determining its constants, such as screw errors, etc., is going on. I have been much worried by batteries for the illumination, but have at last got Treasury sanction for funds to provide a Dynamo, etc. We have a steam engine. The instrument is simply exquisite, and I expect very refined results. [Then follow details of working programme, stellar parallaxes, etc.]

I have lots more to say, but I have already got to a disgraceful length. My wife sends a few lines, and we both send all kind wishes to you and yours.—Y^r sincere friend,
DAVID GILL.

P.S.—I am going to keep your letters. Y^r letters will be filed Q3,¹ the subdivision of my astronomical correspondence formerly occupied by poor Prof^r. Winnecke.

TO MISS AGNES CLERKE

CERES, CAPE COLONY, *April 15, 1888.*

MY DEAR MISS CLERKE,—I am quite ashamed when I look at the date of your delightful letter of Jan^y 9. It is

¹ Airy's system of keeping correspondence.

not very easy to find an excuse, so I shall plead none, but go on with my story.

First of all let me thank you for your important and excellent article in the *Quarterly*, and for y^r rather too kindly mention of my share in the matter of the Paris conference. It is rather a friend's account of a friend's work than the magisterial *we's* of a reviewer. My photographic friend's name is Allis, *not* Aldis. The article as a whole is a most admirable one.

But now to explain our whereabouts. Here we are and have been for the past 9 days in one of the prettiest villages in South Africa, situated in a basin amongst the mountains about 80 miles from Cape Town, and a little over 1500 feet above sea level. In winter the surrounding mountain tops are covered with snow.

The summer has been an exceptionally hot and trying one, and in fact I felt the need of a rest—for my last trip home was so far the reverse of a rest that I was most thankful to get on board ship, where no letters or proof sheets could reach me, and I might lapse into the life of a cabbage for three weeks.

Then I had hard work on arrival and countless things to do, and I had no time to get over a rather sharp nerve tension, the result of overworry from many causes, some of which you know, and which continued after my arrival at the Cape. The settlement of these was followed by our hot weather and a bilious attack—a deferred result of too many Paris, London and other dinners—and so some change and rest were desirable.

So with our Admiral (Sir W. Hunt Grubbe), Major Morris, R.E. (in charge of field work of the Survey and our guest at the Observatory), Dr. Curtis (Surgeon of the Naval Hospital at Simons Bay), and Mrs. Currey (a friend of my wife's), we came up here for rest and change.

I will get you some photographs of the place on our return to Cape Town and send them for y^r South African album—these will convey to you some idea of our surroundings, and when I add a perfectly blue sky, genial, bracing air, and a comfortable hostelry, you will understand how suitable is the place for our purpose.

The mornings we spent lazily, wandering about picking up Tadpoles and sundries for Morris' microscope, eating grapes, gathering figs and mushrooms, etc., etc. Then lunch at one o'clock, and off for an hour or two's

drive to some farm, where partridges or snipe might be found—shot till sunset and returned to dinner. After dinner a game at whist and pipes and then to bed.

Thus I became so idle that I did nothing except to get perfectly well—and I am happy to say my wife did the same. Now I feel that I must begin to do something, and that first something is a letter to you. Then I propose to write a business letter or two, and then to have 4 or 5 days' regular shooting—early and late—and then back to the dear old Observatory again.

Now for matters astronomical. Of course I have no *results* to communicate—and only that all goes well, and that I am working first at the parallax of the brightest stars. For less bright stars I am not sure but that photography may be found the easiest plan for the work—at least for wholesale work. But it must be gone about differently from Pritchard's methods. A *réseau* must be employed to detect the distortion of the film in development. Pritchard has conclusively shown that such distortion takes place, but he is not taking what are now well-known methods to counteract it.

[Here follow details about progress with the astrographic chart and catalogue which, among other matters, are too extensive to be adequately discussed in this book.]

Our electric lighting was completed in February, and is a complete success. It works without a hitch, and is a delight and comfort unspeakable. All the instruments are now so illuminated, and we are already wondering how it was possible to observe without it. My office and the Library are also illuminated with electric light—but you must come and see. Really a voyage is an excellent time in which to ruminate—and you shall have a nice quiet room all to yourself to write in—so that your literary work need not suffer. Besides, the brain must rest sometimes, and August is the time when in any case you would be taking y^r holiday. So come you must, and right happy and welcome shall we make you.

Besides, I don't see why you should remain what the Australians call a one-horse woman (no, they say a one-horse man—I never heard them say woman; it is left to my ungallant pen to say that)—but you are not complete till you have seen and done a little practical astronomy. Your work would take a new and higher character

after a little practical knowledge. I am no flatterer, and I tell you plainly and truly that the only shortcomings in y^r book are due to the want of practical knowledge of practical work—and that y^r mistakes on this point would be cured by a month's seeing and doing of practical work.

For our sakes, for y^r own, for y^r future work and for the cause of astronomy I beg you to come. I am glad y^r book is to be translated into German, but sorry that you are so dissatisfied with the man who is doing it. You should read the proofs—so long as y^r meaning is understood, a little cloudiness will lend an additional charm to the German mind.

I wish I were on the Council of the R.A.S. You should be an honorary member of that Society also. You deserve it as well as Miss Caroline Herschel. The Liverpool Society has shown a good example. Meanwhile, can I help you about anything? If there is any point about which you want my opinion, or any observation you wish made for your purposes, please let me know.

I am glad you like the photographs I sent you—and as you have a Cape Album I will send you others from time to time—anything that I think will tempt you to come. Besides, what a chance for a good paper about a visit to a Southern Observatory. Y^r impressions would be so fresh, y^r mind so ready for all, that I think the result would be quite unique.

My wife is to write with this—I have said my say—I w^d I could put the matter before you in sufficiently tempting terms to compel you to decide to come. Remember me to y^r family circle and to our mutual friends, and believe me, always y^r sincere friend, DAVID GILL.

P.S.—I omitted to tell you about our comet. It was discovered by Mr. Sawerthal, my secretary, whom I employ also as aide-photographer or rather exposurist. He works from midnight to dawn. He watched the comet for a long time (during the exposure of a plate) with the naked eye, then ran for an opera glass, was sure it was a comet, and roused up Finlay, who observed it. Finlay had been comet-hunting in the mornings for the previous fortnight, and it was rather hard on him. However, the discovery has done Sawerthal a great deal of good—doubling his enthusiasm.

TO MISS AGNES CLERKE

CAPE OF GOOD HOPE, *June 16, 1888.*

MY DEAR MISS CLERKE,—This is indeed glorious news that the mail, just arrived, brings us. How splendid is this resolution of yours, how kind of you to come, and, tho' I say it who shouldn't, what a grand thing for you and y^r future work!! Yes, in y^r reasons for coming you quote precisely what I felt most strongly when I wrote to you, that it is an astronomical necessity. In y^r *History of Astronomy* the one weak point was your want of critical knowledge of practical work, and that can only be gained by some experience of such work. I shall prepare a little practical course for you, having regard to y^r limited time, and your special purposes, and to give the thing zest will endeavour to give you opportunity for finding out a few new things which are all ready to be found out, tho' I have never had time to seek them. The spectroscopy of the Southern Heavens is absolutely virgin soil. A telescope with a direct vision prism on it and a selected list of objects, and time to examine and note the spectra of red and variable stars, should alone produce a crop of results, and then I daresay a very little sweeping would yield a small crop of planetary nebulæ; all this, with y^r knowledge of typical spectra, w^d be very easy for you. But besides this you must see something of the old astronomy—and of the pitfalls and sources of systematic error in delicate measures such as parallax work. You will see the final bringing together of the Cape Catalogue for 1885 and the discussion of its errors, comparison with other catalogues, deductions of proper motion, discussion of refraction, etc., etc., besides some curious geodetic and other matters.

And you will arrive just in our best season, when our observatory hill is carpeted with wild flowers, when between the cloudy days the sky is a blacker blue than you ever see in England, when the oaks are putting on their brightest green, and when it is a very joy to breathe the sunny, fragrant air.

Ugh—we have had such a winter. Eight inches of rain here in May, and on the mountain side 27 inches within three miles of us. June has been the same till to-day—rain every day—only 8 sets of Heliometer

observations in May and 4 in June, and only *two* nights on which star photographs could be taken. Last year we had 20 nights observing in May. The contrast is terrible.

A couple of days ago the banks of the Liesbeck River (artificial) broke down about half a mile from the observatory, and as I write the river has formed a new course for itself across my avenue, bursting up my culverts and sweeping a huge breach through the Lovers' walk.

June 18. Two fine sets of Heliometer observations last night with a lovely day make matters brighter. I shall say no more about melancholy meteorology.

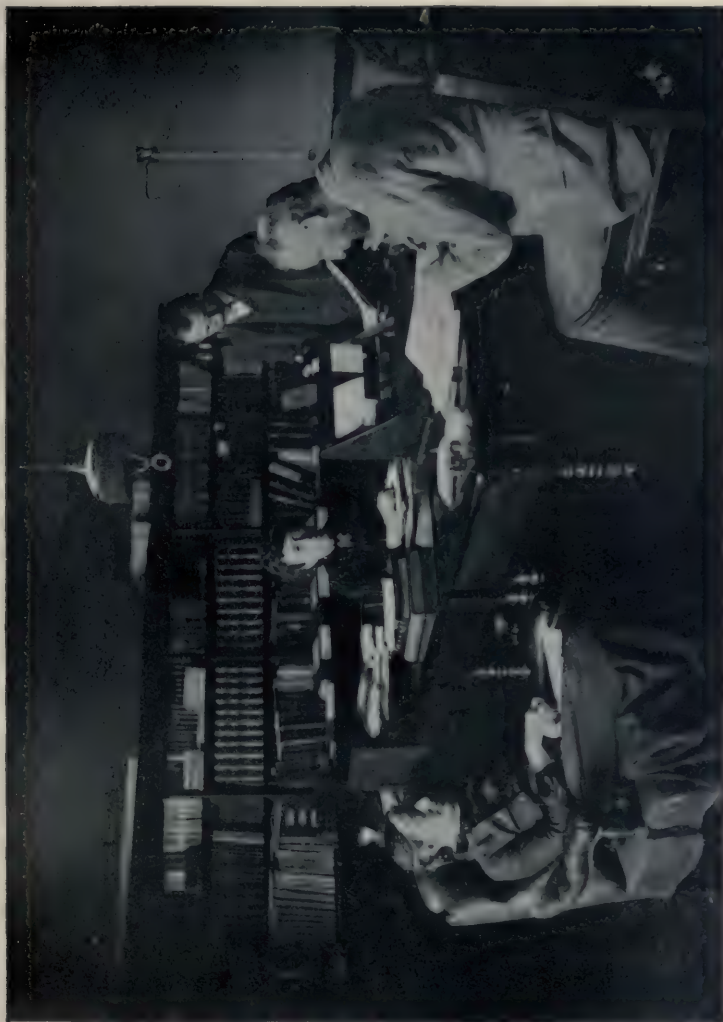
I am greatly interested to hear about Holden Winlock and Hagen's proposed, or so far carried out, work—and it will be a very good and useful work when we get it. But now that the Lick Observatory is fairly under weigh, I do hope that Holden will devote himself entirely to original research, and to the work proper to that fine institution. Of course if the work was done, or Holden's part of it, when he had no special observing to do, well and good, but a man with a 36-inch telescope, 5000 or 6000 feet above sea level, should leave compilation to be done by men who have no such opportunity and dwell in more commonplace abodes. I shall say nothing about the matter, as Holden does not wish it mentioned, but I am much obliged to you for telling me. I have a great desire to see the Lick Observatory—and my friend Holden also. He is a most charming as well as a most able man, and I hope he will stick to the great work where he has so splendid an opportunity.

* * * * *

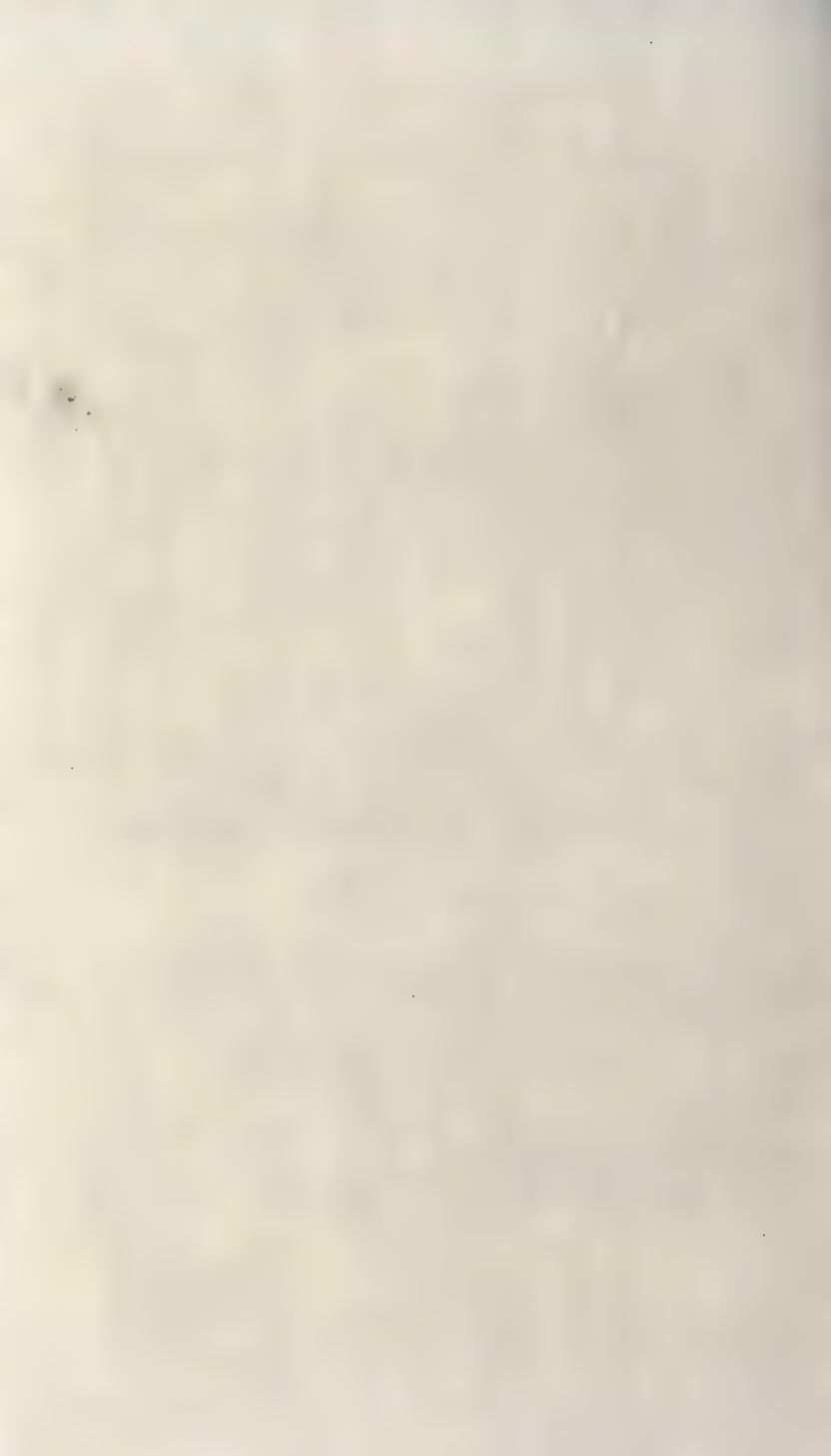
Let Halley wait. I found the remains of the foundations of his observatory on "Halley's Mount" at St. Helena, and if you come here via St. Helena or return that way you might make a pilgrimage to the spot.

[Here follow several pages about the controversies concerning the astrographic chart and catalogue.]

I have been dipping into Lockyer's papers in *Nature*, but in honest truth I have had no time to read, mark,



THE STUDY, CAPE OBSERVATORY. MISS AGNES CLERKE WITH DR. AND MRS. GILL.



learn and inwardly digest them—but so far as I have gone I think he has hit on some very ingenious ideas and explanations—but that the secrets of the universe are yet fully unfolded and explained I agree with you in thinking hardly to be the case.

Now to come to other matters.

[Here follow instructions about choice of a cabin.]

Perhaps if anything turns up I shall write you next mail—if not, we shall simply expect you and wait to hear by what steamer you resolve to sail. Steamers often arrive at night; in that case simply remain on board till I come for you—if you come during the day you will probably find me at the quay before your ship is alongside.

Miss Clerke is coming. *Gaudeamus igitur!!*

Always sincerely yrs,

DAVID GILL.

TO MISS E. M. CLERKE

(*Sister of Miss A. M. Clerke*)

CAPE OF GOOD HOPE, *September 18, 1888.*

MY DEAR MISS CLERKE,—Coming events cast their shadows before. The peacock who had lived in retirement for some time came forth resplendent in a new tail—the tortoise that had come from Madagascar with Father Perry's Transit of Venus expedition laid a nest of eggs—the hillside became a richer carpet of flowers than ever we had seen before—and then we knew that Miss Agnes Clerke must be coming. And come she has, safe and well. She proved herself a good sailor, made herself most delightful and popular on board, and is now delighting everybody at the observatory. We have rather burst into festivity too—we are actually going out three times within a week—a thing I have not done for years—but my observations come on in the early morning just now, so that no loss of work results.

Your sister sits opposite me in my study with a pile of books on either hand, which is gradually growing till she seems to be coming through a gate with rather badly built pillars on either side.

At night she is to be found in the equatoreal—weather

permitting, engaged in flirting with the spectra of variable stars. But, alas, the weather has not been very favourable for their proceedings—and Mr. Sawerthal and she play duets in the evening, or my wife reads aloud—whilst Major Morris and I smoke and y^r sister occasionally loses herself in the milky way, or rather in speculation there anent. I am afraid you will find her a complete Bohemian when she returns to London. She was awfully indignant at first at the bare idea of ever becoming Bohemian—but alas, observatory air and influences are too much for her. You will find her quite Bohemian, if not “a fair Barbarian” when she comes back!!—Forgive my nonsense, and believe me always sincerely
yrs,
DAVID GILL.

To E. B. KNOBEL, London

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
October 30, 1888.

MY DEAR KNOBEL,—I send you by Miss Clerke, who sails from the Cape to-morrow, a paper which, I think, you will care to have for the Monthly Notices. . . . I cannot tell you how much we have enjoyed our visit from Miss Clerke, and we are very sorry she is unable to prolong it. She has acquired a great deal of practical knowledge which will tell effectively in her next book, and not only this, but she has done a good deal of original work on the spectra of the Southern Stars. Her first results will appear in the next number of the *Observatory*. I have often thought that such a work as her *History of Astronomy during the Nineteenth Century* deserves some recognition from the Society. It is not perhaps of the character to entitle her to the medal—but even that is a question about which a good deal could be said in favour of her claims. In any case I think Miss Clerke may be fairly entitled to the honour bestowed upon Miss Caroline Herschel—that of honorary membership of the Society. There are very few persons upon whom this honour might be conferred to whom it would be of higher practical value, as it would give her access of right to the use of the library, which she can only consult at present as a matter of favour. Miss Clerke is engaged just now on another important and more original work, and I feel sure that such recognition of her efforts would cheer her

in her work, which is certainly of a character which the Society must desire to encourage.

The subject is hardly ripe for a formal motion in Council, and certainly should not be brought forward unless it is sure to be nearly unanimously accepted. But if you think well of the idea I should be glad if you would ascertain the feeling of other members of the Council on the matter.—With kind regards, I am, dear Knobel, always sincerely yours,

DAVID GILL.

In the middle of a technical letter to Elkin we read—

6 Nov 1888.—Miss Clerke sailed for England last week. Her visit was a great pleasure to both of us. She plays the piano most exquisitely, as well as being one of the ablest women and most original of thinkers that I ever met. She was also a great social success at the Cape. She was quite at home with an Equatoreal before she left, and did a lot of flirtation with star spectra.

The reader is strongly recommended to read the continuation of letters to Miss Agnes Clerke at p. 363.

CHAPTER XVIII

DAYS OF SORROW (1890-6)

Letters to E. B. Knobel—Three orphan nephews adopted—Successful results of computing—Sir Robert Ball—Offer of Cambridge professorship to Gill—Mrs. Gill's serious illness—Elkin's engagement.

Happy is the man who can say with simplicity, "Thy will be done!"—CHARLES WAGNER of Paris.

THE visit of the Gills to England in 1891 had no very great astronomical importance; but it was the last time that they were to see Mrs. Black, the mother of Mrs. Gill. She died on February 9, 1892, aged eighty.

Both before and shortly after this visit to England in 1891, much sorrow fell to their lot. Gill was in the habit of writing very intimately about private affairs to Mr. E. B. Knobel.

TO E. B. KNOBEL

CAPE OF GOOD HOPE, 1890, *July 16.*

By this mail I am addressing a paper by Mr. H. Jacoby¹ . . . to Mr. Wesley [Asst. Sec. R.A.S.].

Jacoby has been working here at the Heliometer, and has made these Tables as well as done observing and some other computing.

You will, I think, be pleased to hear that I have been elected a Corresp^s Member of the Berlin Academy. I owe this very great honour, of course, to Auwers, but in

¹ The American astronomer who visited the Cape for the eclipse of 1890, stayed on for practical work at the Observatory, and married Miss Maclear, daughter of the Cape Astronomer, Sir Thomas Maclear.

a very kind letter which he sent me he tells me that the election was unanimous in all its four stages.

TO E. B. KNOBEL

1890, *September 8.*

My wife's mother is old and was rather dangerously ill, and we intended to hurry home as soon as we could. . . . But we have had so much better news that, in accordance with her wish, we are proposing to change our plan so as not to have our holiday entirely in the winter, which for my wife's sake I should like to avoid; and we should sail from the Cape about the middle of January.

TO E. B. KNOBEL

CAPE OF GOOD HOPE, 1892, *January 3.*

* * * * *

What a year of sadness the past one has been! and the new year has commenced very sadly here also. Six months ago or less Finlay lost his eldest boy. He died of consumption at Bloemfontein—and Finlay and his wife arrived just in time to be too late for the end. Rad, their next boy, who was the baby when we came, died within the past six hours. He has been in bed for over three months—originally from typhoid fever—incurred by drinking water from a tank over which some weaver birds had built nests, as I think I told you. Tubercular disease of the hip joint supervened, followed by a bilious attack and 12 hours' vomiting. This ruptured a blood vessel, and he died suddenly this afternoon from cessation of the heart's action. Poor Finlay is in terrible despair.

Our own anxieties about my wife's dear sister Bessie I think you know, and they are still a serious load to bear.

God grant that the silver lining of the cloud may soon show itself.

In this year, 1892, Mr. Knobel visited the Cape for his health.

TO E. B. KNOBEL

CAPE OF GOOD HOPE, 1892, *January 22.*

* * * * *

I send this to the Union S.S. Office in Cape Town, directing them to forward it to you.

Thrice welcome, my dear friend, to South Africa. I would that bad health had not been the cause of this visit—which otherwise would be one of unalloyed pleasure to us.

Mr. Knobel stayed with the Gills some months, much to their delight, and to the benefit of his health.

TO E. B. KNOBEL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1892, *May 31.*

MY DEAR KNOBEL,—We have had sad and sorrowful times since you left.

Just three weeks ago I had walked from Rondebosch after a game of golf, and met the boy coming from the station with a telegram. I opened it and read, “Maggie died pneumonia send instructions.”

My poor sister—she had followed her husband very soon.¹ I got home before I realized the news and quite broke down. My wife first did me good, by rousing me to duty—pointing out that I was now the guardian of Maggie’s boys (5, 7 and 9 years old),² and that we ought to send for them: so as to bring them up by love and not by mere authority—and that they should come to us as directly as possible from their mother’s care. I felt this was right and set about making all necessary arrangements—we hope they will sail on July 23.

This and many other matters have entirely engrossed my time—so that I could not write to you—or rather was not in the spirits to do so.

I am only writing now by way of explanation of my silence—and to tell you of the delight that y^r wife’s and y^r letters have given us. Mad about golf—well, that will do you no end of good.

Ever, dear Knobel, y^r loving friend, DAVID GILL.

From this date onwards the care of these nephews whom they adopted was the greatest happiness to the Gills.

When the little Powell boys took up their quarters at the Observatory they became objects of life interest day by day to Mrs. Gill. Her husband’s occupations interfered with the continuity of his attentions to them, and

¹ [Mr. Powell had died a few weeks previously.]

² [Lady Gill says 4, 7 and 8 years old.]

at that time he was associated in their minds chiefly with the pillow-fights in which he took part.

But he was also made use of as "the last resort" in cases of disobedience. Lady Gill says that he was very tolerant and knowledgeable in the ways of boys. When his wife was in terror at their quarrels, David would say, "Let them fight it out."

When Mrs. Gill told Harry how cowardly it was to beat his little brother, the boy said, "How much am I to allow him to cheek me before I beat him?" She referred this to her husband, who said, "The boy has right on his side if the young 'un is taking advantage of his being so little. You will find that the best answer is that he should wait till the next day before punishing him." As the quarrels never lasted more than half an hour, the next day brought no punishment and all went smoothly.

During the great European war the two elder boys have done splendid work for their country. Captain Harry Powell (South Staffordshire Regiment) was killed in action near Ypres in December 1914. Major Fred Powell (The Dorsetshire Regiment) was wounded in our advance from the Persian Gulf, a shoulder wound, in June 1915.

He returned to the front in Mesopotamia, was twice mentioned in dispatches, received the Military Cross, was again and more seriously wounded, and sent home to recover.

Bruce Powell was engaged upon engineering duties in South Africa. He then came to London, having made the voyage to give his services in the war, and got a commission in the Artillery.

Extract from letters from Gill at the Cape to E. B. Knobel in London.

TO E. B. KNOBEL

1892, July 6.

The mails and cables, whose arrival we had begun to dread, have now ceased to bring bad news—as they did

almost every week for a time, telling of the death of, or a disaster to, friends.

The two last mails bring news of a different sort :—

My good friend Auwers has received the order “*Pour la m rite*,” which I regard as the highest distinction open to a literary or scientific man; Vogel has been elected a *Corr * Member of the Berlin Academy—and the R¹ Society of Edinburgh have done me the honour of electing me an Honorary Fellow (their list is limited to 20 Hon^y Fellows who are British subjects, who must be highly distinguished in science or literature, and includes Owen, Huxley, Airy, Tennyson, Froude, Rayleigh, etc.).

But it is again the antipodes of good news that you are again feeling the pains in y^r head—halve y^r hours of work—double y^r hours of golf and take things more easily.

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1892, *July 16.*

MY DEAR KNOBEL, . . .—Many thanks for all your kind sympathy—I fear the little chaps will have sailed long ere this reaches you. They leave by the *Tartar* on July 23. A new species of cares are upon me already—tuition, male or female—tonsils enlarged, should they be cut or not—should the eldest boy’s wish for promotion from knickerbockers to trowsers be granted, etc., etc. [In] these things I should right gladly have had you to consult with. However, I daresay I shall know all about them very soon.

* * * * *

Your triumphant account of y^r golf experiences at first rather staggered me—but I find after all that you have to pass through the valley of affliction like other mortals. But get used to the driver at any cost; you will never enjoy the game till you do.

My wife is wonderfully well—we both send our love to you and y^m, ever dear old man, sincerely yours,

DAVID GILL.

TO E. B. KNOBEL

CAPE OBSERVATORY, 1892, *December 7.*

I am toiling away at the completion of the Victoria and Sappho observations. The results are of extraordinary interest and of high accuracy. The half of the final equations for Victoria are solved, and in a few

weeks will be completed. The Tabular quantities and differential coefficients for Sappho are computed, and being finally revised.

TO E. B. KNOBEL

1892, December 21.

Take the Victoria observations that are now reduced. They yield a value of the $\odot^r$ parallax so exact, the different groups agreeing with such precision that I am confident it will be accepted by astronomers generally as definitive. But like the good gentleman who went out to seek his father's asses and found a kingdom,—so it has been with Victoria.

The Lunar equation, as you know, was determined by Leverrier from a century of Greenwich, Paris and Königsberg observations of the Sun, and everybody has supposed it to be correct.

The practical fact is that where the individual errors may and do amount to $2''$ or $3''$ (arc), as they often do in observations of the $\odot$'s R. A., you cannot determine by *any number* of such observations small quantities with the necessary accuracy. So with the Lunar Equation. When all the great mass of Victoria obs. made with the Heliometer are combined in conjunction with the triangulation of the comparison stars, we have for the first time in the history of Astronomy a series of planetary observations equal in accuracy to the most refined observations for stellar parallax. The result is that for the 15 groups into which the obs. are divided, the difference between the Tabular and observed R. A.'s are all on a curve whose amplitude is over $0''.1$ thus [sketch of a sine curve], and Decl^{ns} also—that both curves agree absolutely in the period of the moon's revolution—the maximum and minimum of curves agrees with the epoch when the planet's and moon's longitudes differ 90° , and the relative amplitudes agree with a correction of $-0''.1$ to Leverrier's value $6''.50$ of the Lunar Equation. Mark now the extraordinary value of this.

We have got from these observations not merely the most valuable determination extant of the $\odot^r$ parallax—which puts an end to all doubt about that constant, and therefore gives us the Earth's mass, but it gives us, combined with the Lunar Equation, by far the most accurate determination of the Mass of the Moon—and practically

will put our new Astronomical Constants on a sound and satisfactory basis. The parallax of the moon will be deduced with far greater accuracy than it can be observed—so probably will the Nutation Constant.

* * * * *

We have had the saddest news about the health of my wife's dear sister Bessie, who was just about to visit us at the Cape—so sad and serious that we may have to run home for a few weeks next month.

As it turned out Miss Bessie Black's state of health was now so alarming that the Gills had to make a rapid journey from Cape Town to Aberdeen and back at the beginning of 1893.

TO PROFESSOR KAPTEYN

CAPE OF GOOD HOPE, 1892, *November 9.*

This year our climate has gone entirely to the bad. The antarctic ice has come far north. It is stated that icebergs have been seen within 60 miles of the Cape of Good Hope. Be that as it may, we have had such a season of cloud as I have never seen before. I was up *every* morning in July, August and September for Aberration—latitude, zenith telescope observations, and just got three observations in each month.

* * * * *

I have been plunged deep, smothered in fact, by the Victoria and Sappho parallax business. Newcomb has been pressing me to finish it by the end of the year. I only hope it won't finish me.

* * * * *

I told you I think about the death of my sister and her husband within six weeks of each other, and that her three little boys—my nephews—are now with us, ages 5, 8 and 9 years. They are fine little fellows and thriving splendidly. My wife is working at Latin, and is devoted to them.

TO PROFESSOR KAPTEYN

1892, *December 28.*

The Solar Parallax is $8''.80$.

Leverrier's value of the Lunar Eqⁿ must be reduced by $-0''.11$, and becomes $6''.39$.

In the same year, 1892, Professor Ball succeeded to Professor J. C. Adams' chair, and became head of the Observatory at Cambridge. The following letters are interesting. The Chair was offered to Dr. Gill, but he insisted that he could do more good for astronomy by completing the plans of work which he had laid down for himself at the Cape of Good Hope.

FROM SIR MICHAEL FOSTER, Sec. R. S.

SHELFORD, CAMBRIDGE, *February 23, 1892.*

MY DEAR GILL,—I got your letter to-day. . . . Your telegram did not surprise me; indeed, I think you are quite right, and felt some compunctions in making you expend anything on a wire. But it was agreed *ubique et ab omnibus* that you were the man to have the post if you would take it, and when I spoke to you at the Royal nothing definite was said. Hence I and some friends agreed that it would not do to go on without a definite refusal from you. We had a faint hope that perhaps at the last you might give in, but we feared to get such a reply as did arrive.

I can only say that I think the appointment of yourself would have met with applause all round. . . .

Ever yours,

M. FOSTER.

LETTER FROM DR. GILL TO PROFESSOR BALL

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,

March 9, 1892.

I have just heard that you have been elected Adams' successor at Cambridge, and I write at once to congratulate you, or rather to tell you how much I think Cambridge is to be congratulated. I did not think they would be able to tempt you from Dublin, and I wondered where a suitable man could be found. There is a noble transit circle and the makings of a grand equatorial, and I think it would have been a thousand pities if these had been put in the hands of a man who is *only* a mathematician. Besides all the possibilities which your equipment presents, there is a great mass of Adams' unfinished work which astronomy stands sorely in need of.

When George Darwin was made Plumerian Professor I urged him to take up the Theory of Jupiter's Satellites, and the construction of new tables. He began the work, and after labouring for some time went to Adams to discuss some of its points with him. Adams took him to a closet, whence he produced papers showing that all Darwin had been working at for a year had already been done by himself, and indeed more, so, seeing that he was working on ground already occupied, Darwin went no further.

If Darwin and you, in conjunction with W. G. Adams, would take up the editing of J. C. Adams's unpublished papers, you would confer a great boon on astronomers, and help also to erect a great memorial to your great predecessor.¹ The fact of the existence of these papers has deterred many an able young man from entering a field of work in which he knew that Adams had been working before him.

Forgive my presumption in making these suggestions. I only make them now because I know that very soon you must have completed your working programme, and if my suggestion is of any value now it would then be too late, because your hands would be otherwise full.

In this connexion it will not be out of place to quote the words of Sir Robert Ball some years later in speaking of Sir David Gill at a dinner at Trinity College, Dublin. He said—

He is one of my oldest friends. He is the most distinguished practical British astronomer since Bradley who has presided over one of our national observatories. As Royal Astronomer at the Cape of Good Hope, he has made discoveries more valuable than all the treasures of the Rand. He now draws near to the close of his service. We give to him the heartiest of welcomes, not so much for his practical services, not so much for his great discoveries; we welcome him as one who, with the purest and most single-minded purpose, has devoted himself to the search after truth.²

¹ [This has been done by Professor R. A. Sampson, in association with the late Professor W. G. Adams, and Mr. J. W. L. Glaisher.]

² *Reminiscences and Letters of Sir Robert Ball*, edited by W. Valentine Ball. Cassell, 1915, p. 274.

The next date of importance in Dr. Gill's career was the year 1896, the fifth visit to England and the third of those which mark milestones (1884, 1887, 1896) in his progress.

Before that date, however, there was a renewal of the days of sorrow. For the year 1895 brought to every one in the Observatory the greatest sorrow of all. There had been many occasions when Mrs. Gill's ill-health clouded the horizon. But never for very long had her bright and cheerful company ceased to enliven the household. Never for very long had she been unable to help her husband's leisure moments by lively conversation, or by reading while he smoked quietly in the intervals of work.

In May 1895 a change came, and she was utterly prostrated.

A long letter from the Cape to Professor Kapteyn, dated 1895, April 9, about the completion of the C.P.D., contains, towards its close, the following expressions—

It is a great satisfaction to me to think—on no less authority than that of y^r own dear wife—that the Durchmusterung has not been over much work for you. I mean that you are physically and mentally better and not worse for your labours. I also congratulate myself that the material furnished to you—however many its imperfections—have enabled you to do so much, and to establish for yourself a reputation and position amongst the astronomers of y^r time such as few men of your age enjoy.

Above all I rejoice in the true friend I have found in you—may that friendship ever grow with our years.

TO PROFESSOR KAPTEYN

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
February 8, 1896.

MY DEAR KAPTEYN,—By the same mail with this letter I am sending to the printers my introduction to the Cape Photo. D^m, and I owe you an apology for my delay. The fact is that I have been overwrought, not

so much with my work as with the terrible anxiety and strain connected with the nervous illness of my dear wife. Week after week I found myself quite unable to write anything, and when I was in working condition I was often obliged to devote my time to correspondence and plans connected with the new McClean Telescope. First and last I have drawn, sketched or described every detail of the Instrument, its Objective prism attachment, micrometers, spectroscope, observatory with rising floor, etc., etc., and in many cases discussed and re-discussed alterations proposed by Mr. McClean or Grubb, etc.

The completing of the account of the Geodetic Survey of South Africa, of which the last proof sheet has gone to press, has also pressed heavily upon me—as well as a great deal of private and other correspondence which my dear wife used to take off my hands.

The Doctors seem to think she will be able to sail with me (accompanied by a nurse) to England on the 1st of April. . . .

About my Introduction I am afraid you will say, “The mountain has been in labour and has brought forth a mouse.” It is indeed a very insignificant thing to have occupied so long a time, but I pray God you may never have to execute work under similar difficulties, or know the effort which work has cost me during the past nine months.

The letters received by Dr. Gill about this period, both at the time of the Jameson raid and throughout the South African war, from men who were in the thick of these affairs, bear testimony to the soundness of judgment with which he was credited. Years hence some of these may be worth publishing as facts of history. The biographer who has been privileged to read them must for the present be content to note the eagerness with which all administrators, civil, naval and military, sought his calm judgment in those critical times.

One of these letters, from so distinguished an observer and artist as Mr. Furze, who, after a visit to the observatory, was in Johannesburg in 1895–6, is filled with interesting descriptions of what happened at the time of the

Jameson raid, with a keen insight into deductions, shared by Gill, concerning revolutions and national characteristics. But these details must be omitted. The beginning and end, however, of this letter illustrate the value attached to that time by thoughtful observers to the friendship of Dr. and Mrs. Gill. The letter begins with the words, "My dear philosopher and friend." It ends as follows—

Please write and tell me how Mrs. Gill is. Give her my kindest regards and tell her that if I stay here long I feel I shall be drawn into the maelstrom of stocks and shares, and shall want a lot of her society to fumigate my moral atmosphere.

The same year (1896) brought them joyous news from their dear friend Elkin in the United States. The affection that existed between them was touching in its tenderness. We read in history of many a Damon and Pythias, of many a pair of men whose mutual affection left self altogether out of account. It is doubtful if ever there was another astronomer who had so many of these whole-hearted, self-denying friendships, in each one of which either partner was literally ready to sacrifice everything for his friend. The anguish suffered by David Gill when one of his dearest friends was in trouble was balanced only by his exuberance of boyish joy when good fortune attended him.

TO DR. ELKIN

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1896, *March 3.*

MY DEAR ELKIN,—I have postponed for a mail or two answering your letter and its glorious good news in the hope that my dear wife would be able to send a few lines with mine. But I am sorry to say she is not yet able, having been not so well during the past three weeks. In nervous depression anything that touches the emotions is the thing that is most trying, and Bella feels so much sympathy with you in this that she is quite unable to write.

But you know right well how truly sorry we both are that the bright and joyous congratulations which would have accompanied mine cannot be written—tho' Bella sends them in her heart all the same. How truly glad we are that the bit of yourself that you lost is coming back to you with a charming addition—you can readily imagine, and I hope with all my heart that ere long we shall be able to meet you in double harness as happy and cosy as it is possible for man and wife to be—and we both also well and able to share your happiness.

* * * * *

God bless you, old man. If an earnest, capable man like yourself—a loyal friend as I have ever found you—cannot make a little woman happy, then I am very much mistaken.

I can wish you and your bride no better wish than that you may be as happy as we have been for 25 years of our married life—yes, and except these bonds—are now to the present day.

Bella joins me in loving messages to you—and, if we may, also to HER.—Ever thine,
DAVID GILL.

CHAPTER XIX

PATIENCE REWARDED (1896—1901)

Home on leave—Astronomical recognition of results—St. Moritz and Paris—Reversible transit circle—Victoria Telescope—Bryan Cookson.

THE last chapter has been the narrative of a sad page in the story of Gill's life. But there were compensations, and none greater than the magnificent offer by Mr. Frank McClean, in 1894, of a splendid telescope, with accessories, for the Cape Observatory. It was not set up and completed until 1901, so the continuity of the narrative will be better maintained by relegating the delightful episode to later pages of this chapter, and by now recounting briefly some important events which occurred during the visit to England, Paris and St. Moritz in 1896.

TO DR. ELKIN

6 B^D DU CHATEAU NEUILLY, PARIS,
1896, *June 27.*

MY DEAR ELKIN,—And so you are off, and the wedding trip over. Would that we could have shared some of it with you. But I am thankful to tell you that Bella has been on the whole improving in health, and the doctor thinks that in course of three weeks or so she will be able to travel to Switzerland.

I crossed to London on the night of Thursday June 11, to see about some business at the Admiralty, and about some affairs between Grubb and McClean which were giving trouble.

I was staying with our old friend Adm^l Sir F. Richards. On Saturday night I got a telegram from the clerk of Session of the Glasgow University to say that my invita-

tion to the Kelvin Jubilee had gone to the Cape. They had heard I was in London and hoped I would come.

I started off on Sunday night.

It was a very grand and very interesting function. Representatives from all parts of the world were there, and many that I was very glad to meet. I was specially glad to see Cleveland Abbe and many others whom I sh^d have had no other opportunity of meeting.

The whole function was delightful to me, for Lord Kelvin has been one of my earliest and best friends—and the love and reverence paid him by all were a great joy to me.

I returned with Newcomb on the Wednesday and crossed to Paris on the Thursday—and found Bella better during the week I had been away. Madame de Montmort had been a good angel to her, and had stayed at this place with her during my absence.

* * * *

I am being spoilt by kindness. Every one here is so kind, and on Monday they made me a Correspondent of the Institute (Acad. des Sciences) in succession to Cayley. It seems a mockery to put me to succeed such a great man, but indeed Cayley sh^d have been elected under the section of geometry—and not of Astronomy as he was.

* * * *

Bella joins me in love to y^r dear Katy and y^r self.—
Ever thine,

DAVID GILL.

It was during the residence in Paris at this time that on May 20, 1896, Gill received the Companionship of the Bath. This was the final act in an amusing comedy sometimes told to his most intimate friends by Gill. He had been told earlier that he was to be received into the order of St. Michael and St. George. Now, Gill had noted with disgust the bestowal of the K.C.M.G. on utterly unworthy politicians at the Cape; so, in reply, he flatly refused to be associated in Cape Colony in this way with such characters. The Admiralty understood their astronomer, and he got the C.B. and eventually the K.C.B.

After the Astrographic Congress at Paris in 1896, Gill attended there the important meeting of the Directors

of National Ephemerides [*alias* Nautical Almanacs], who had to decide upon some of the astronomical constants to be adopted in their calculations. At this congress Gill's value of the Mean Solar Parallax (and the sun's distance), with the resulting value for the constant of Aberration, also his value of the Mass of the moon, with the resulting value of the constant of nutation, all derived from his Minor Planet work by heliometer, were definitively accepted by those astronomers from all parts of the world, who calculate the data of national nautical almanacs.

From Paris they went to St. Moritz for Mrs. Gill's health, and before returning to London Gill was able to pay a visit to Professor Kapteyn at Groningen, where he became a great favourite with the Professor's children.

TO PROFESSOR KAPTEYN

LONDON, 1896, October 15.

. . . I arrived from Berlin on Saturday last . . . , but only called at the R.A.S. to-day, and found the photographs and the dear lassies' letters. . . . I had such a delightful time at Groningen, and am greatly delighted with the photographs. I will write my little sweethearts in a few days.

It was during his home visit in 1896 that Gill put forward his proposals for erecting at the Cape a transit circle specially designed by himself for overcoming many of the systematic errors which limit the accuracy of fundamental astronomy of position. The Admiralty, on the advice of Admiral Wharton, supported him. The request was immediately granted by the Treasury.

At this date, 1896, the boundary of German South-west Africa was a source of diplomatic friction. Gill's surveys covered part of that region, and after a consultation at the Colonial Office he was sent by Mr. Joseph Chamberlain to Berlin that a *modus vivendi* might be created. His intimate knowledge of the situation and his tactful conduct were rewarded with success, and he

received the thanks of the Foreign Office. The boundary survey was afterwards carried out, Gill acting as Director for both governments.

Having briefly indicated some of the incidents attending the visit to Europe in 1896, it may be well to state now that there were only two later visits home, in 1900 and 1904, before the final departure from South Africa in 1906. The former of these was the first real holiday which he had enjoyed since he went to the Cape in 1879. The latter was much occupied in preparations for the visit in 1905, of the British Association for the Advancement of Science, to South Africa, the local arrangements for which were left almost entirely in Sir David Gill's hands. During both of these absences he was able to leave the conduct of the observatory in the able hands of Mr. S. S. Hough, who eventually succeeded him on his retirement in 1907. The great reversible Transit Circle and the Victoria Telescope were not completed until 1901-2. Of these we will now say a few words.

The Transit Circle is the principal instrument used by astronomers for finding the absolute positions of any heavenly bodies, and the only kind of instrument that has been proved to be fit for obtaining the fundamental data of astronomy. But all instruments made by human hands are imperfect, and Gill considered that it was the first duty of a practical astronomer to reduce these imperfections to a minimum. What his duty afterwards may be is well expressed in a letter to Professor Kapteyn from the Cape, dated so far back as 1885, January 18.

But however perfect an instrument may be (and it is the astronomer's business to see that it is perfect), it is the astronomer's further business to look upon it with complete and utter mistrust.

Gill had discovered, in 1877, a personal error, in using the transit circle, varying with the magnitude of the star; and, in 1880, one depending on the star's

traversing the wires from left to right or from right to left. Again, he had noticed the inequalities of temperature inside and outside the conventional transit house, and these create errors by atmospheric refraction. Temperature-changes affect the levels of the piers upon which the instrument rests, as well as their uprightness, and also affect the size of the circle divisions and their distance from the reading-microscopes. The local heating from an observer's body or from the illuminating lamps may be sufficient to introduce error. There is always a certain flexure of the telescope tube varying with the altitude of the star observed, and he had found that the strain is not always in the same plane as the stress. The meridian marks employed to test the setting of the instrument cannot always be fixed with absolute permanence.

Gill sought for remedies to reduce all these and other sources of error to a minimum, and his completed design was certainly original. In the hands of almost any other man it would have been condemned as experimental. When the writer inspected it, during construction, at the works of Troughton & Simms, the late Mr. James Simms made some remark which meant: "No one but Gill would have ventured upon so great a departure from the orthodox design of a transit circle." A full decision as to the success of this great invention will be possible only after many years of actual work with it.

The final result can be described only in technical language, and can be appreciated only by the practical astronomer who is also an engineer. Such a one, in studying the published description with the accompanying detailed drawings, cannot fail to be impressed by the ingenuity and boldness with which he overcame the difficulties in his way.

A single case may be here mentioned. A very serious trouble arose from the absence of good foundations for his meridian marks. Even in his Dun Echt days he had

been inclined to supplement his collimating telescopes by distant meridian marks viewed through a lens of about 300 feet focus as at Pulkowa. In adopting this plan he had to fix the marks and the lenses very firmly, with as little liability as possible to any kind of shifting. Under the conditions existing at the Cape observatory, he eventually dug pits of great depth and fastened his apparatus to the solid nucleus of the world, the very ancient geological formation called the Malmesbury beds, and, following Bohnenberger, he invented an optical device of the highest merit for ensuring that certain marks, on the top of his columns, built over the pits, should be exactly over certain points fixed upon the Malmesbury beds. The stability of these marks is now the envy of all astronomers. So it was with all his difficulties. They disappeared under his skill as an engineer and designer of instruments.

The following quotation expresses the opinion of the astronomical world upon Sir David Gill's beautiful device for the meridian marks—

Azimuths determined from these marks have been proved so reliable that by comparison with stellar observations even the variation of latitude, or rather the complementary polar deviation, may be exhibited. The existence of these marks rendered possible Mr. Hough's scrutiny of the periodic errors in R.A. of the Catalogues of Newcomb and Boss.¹

Dr. Backlund, of Pulkowa Observatory, speaks of this instrument and its accessories as "constituting presently the last word of perfection."

This opinion seems to agree with the general verdict of astronomers, and with that of Mr. S. S. Hough, who has had the experience of using it.

One of the most delightful experiences met with by Sir David Gill in any part of his scientific career

¹ R.A.S., M.N., lxxiii. 3; January, 1915.

We need not, however, discuss these matters—for the supreme consideration is my wife's health—and that decides me.

I am thankful that the B.A. meeting has gone off so well. The local committees worked splendidly. Jo'berg went wild with hospitality and entertained not the official party only, but every Dick, Tom and Harry who visited them and was a member of the B.A. One dear old lady for whom, at her request, I had engaged rooms at Heath's hotel in Johannesburg, when I asked her if she was comfortable, said, "Oh, yes, and the rooms are quite nice both for myself and my maid, but a strange man—a man I had never seen before—insists that he is to pay all my hotel expenses—is it not embarrassing?"—I could only laugh and say, "Most compromising!"

* * * * *

Ever thine,

DAVID GILL.

TO DR. A. ROBERTS

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1906, *February 20.*

MY DEAR ROBERTS,—. . . I am beginning to feel better but am still very weak and not fit for much work. I got enteritis at the beginning of January—had 2 relapses and have not picked up much strength yet.

My wife, I am sorry to tell you, is down with gastritis and low fever so we are a sorry couple, and feel that neither of us may face another Cape summer. . . .

We will look out for you on your arrival. I think Mr. Simms of Troughton & Simms will be with us. . . . He is coming to see his new Transit Circle. . . .

Ever thine,

DAVID GILL.

The end of the British Association meeting so far as concerned the Gills was deplorable in the death under their roof of Admiral Sir William Wharton, the Hydrographer to the Admiralty, whose high scientific attainments had of late years been of such signal service to the observatory.

Wharton had been one of Gill's closest friends since 1874, and his death under the distressing circumstances was a terrible blow to his affectionate fellow worker.

The subject seems too sacred to be dealt with here

by reproducing the letters which tell of all he did for the mitigation of the blow to the bereaved family. The writer feels, not only in this case but in many others of a similar nature, that he has, through a perhaps false delicacy, failed to exhibit fully the heartfelt solicitude with which David Gill spent himself in the endeavour to support and help his friends in affliction.

The writer must also confess to having, in the same spirit, passed over many acts disclosed in the letters, in some of which Gill intervened either to have a well-merited honour conferred for valuable services, or to protect a worker in the cause of science from neglect or calumny. There is plenty of correspondence to show how he persisted and "refused every refusal," and how much his name came to be revered for this by families not only in South Africa and England but even in France and the United States. He kept these acts to himself in his lifetime. It is better that even now they should remain unrecorded. But the writer, who has seen the letters, feels bound to express his admiration, which is shared by those who benefited from his generous tenacity.

Even before he retired to England, European leaders in refined and accurate work were beginning to seek Sir David Gill's co-operation in advance. An example of this is the following letter from the official head of astronomy in Germany.

FROM DR. W. FOERSTER

BERLIN, WESTEND, ATHORNALLEC, *May 15, 1906.*

MY DEAR SIR DAVID GILL,—After the death of Mr. Chaney, Member of the International Committee of Weights and Measures, I wrote to Sir George Darwin, asking his advice with regard to the election of a successor. . . .

He opens to us the possibility of gaining your personal presence and collaboration as Member of the Committee. . . .

Now, my dear Sir David, there is no scientific man in

the British Empire who has so high merits in the great field of measuring and of finally extending the community and rational development of high metrology, than you. Therefore; no better British Member of our committee could be elected than Sir David Gill.

I am fully sure of the unanimity of voices for this election, and I beg you to send me as soon as possible your answer to this proposition.

* * * * *

I am, dear friend and colleague, always yours very sincerely,
W. FOERSTER.

Astronomically, the last years of Gill's life at the Cape were mainly occupied in what may be spoken of as teaching his valuable instruments to earn their living.

1. The *Heliometer* was diligently set to work to observe positions of major planets.

2. The division errors and pivot errors of the *Reversible Transit Circle* were measured, sometimes by ingenious methods invented by Gill, and the Repsold travelling wire, with improvements of his own, added.

3. The *Victoria Telescope* was mainly trained and used for getting accurate radial velocities so as to perfect his method of determining the constant of aberration and consequentially confirming his value of the Solar Parallax.

4. The *Astrographic Telescope* was steadily pursuing its own rôle for the astrographic chart and catalogue.

5. The old *Transit Circle*, as a differential instrument, assisted the new, especially in getting out the Lunar Parallax from observations of the crater Mostyn A, in conjunction with Greenwich.

6. The 6-inch equatoreal and other minor instruments were kept in order, ready for all occasional work.

7. The "*perfect clock*," perhaps too complicated in parts of its construction owing to the suggestions of friends, was set up and tested. It seems to have had only one important defect (obviously curable), the failure of electrical contacts. Eventually the Admiralty stopped

all further experiments, which cost much. This clock, almost certainly capable of becoming the most perfect ever constructed,¹ now, unfortunately, lies at the Cape Observatory incomplete and discarded.

All accounts received from the Cape up to this date strengthen the opinion that the Cape Observatory is likely for a long time to be regarded as "The Gill Observatory," fitted with Gill Instruments, operated by the Gill Spirit. In *Nature* of January 27, 1916, we read—

Although Sir David Gill retired from the direction of the Cape Observatory early in 1907, and died just 7 years later, the volumes from that observatory which have recently been distributed are essentially his work. Even in the contributions of his successor and collaborateur, Gill's inspiration and design are evident. It is not too much to say that the same spirit of energy and thoroughness will endure in the pages of future publications long after his name has disappeared from the title. No greater tribute can be paid to the memory of a great man. His personal achievement was considerable, but beyond that his influence on others will surely live.

It says much for Mr. Hough that he is determined to

¹ Mr. E. T. Cottingham, F.R.A.S., the distinguished horologist and practical clockmaker, bears witness that "the barometric, thermal and circular errors being cured by the air-tight casing in a room of constant temperature, Gill's beautiful escapement gives to the pendulum a very constant gravity impulse, not only free from clock train error, but superior to all other forms of gravity escapement in freedom from the varying frictions in unlocking the gravity arm and the oil factor on the locking face, and also in the greatly reduced mechanical shock."

Mr. Cottingham, who is one of the few who are masters of the Reifer and other clocks of high precision, has experimented for years upon the Gill escapement, has entirely overcome the electrical trouble, and cannot foresee any cause of error. It may be pointed out that the impulses and recording can all be applied by a subsidiary astronomical clock, which would be regulated by comparison with the Gill pendulum in the observatory once or twice a day, leaving the Gill pendulum perfectly free to vibrate uniformly for ages, except for variations in gravity. It is not impossible that the Gill clock may in the future be used to test the uniformity of the earth's rotation from century to century. The escapement is described in the British Association Reports, 1880.

maintain the traditions for thoroughness as a feature of the Cape Observatory. Under his guidance the reputation of the observatory is growing with the years, and he will be able to carry on the effort with which he has started so successfully, thus conferring incalculable benefit upon astronomy of the future.

The remaining part of this book must be largely confined to the personal characteristics of the man David Gill, and will include some account of his last years, in England, where his innate humanity found ample scope in the ever-widening sphere of delightful friendships that filled the last years of his life.

It was a severe wrench for Sir David and Lady Gill to tear themselves away from the happy home and friendships of twenty-seven years in the glorious sunshine of the Cape. They both felt it deeply, but the health of both made the step imperative.

Before proceeding to the concluding section of this book, and without any attempt at analysis of Gill's scientific researches, the writer cannot refrain from indulging in a limited and perhaps fanciful survey, from a new point of view, of three only from among Gill's most patiently elaborated, and successfully completed researches at the Cape.

It has been recorded that in the first years of his directorship, and prior to 1884, his attention was already fixed upon three great undertakings involving the highest accuracy attainable.

(1) Geodetic triangulation and the measurement of an arc of meridian.

(2) Observations of minor planets with a powerful heliometer, to obtain a final definitive value of the sun's distance from the earth (solar parallax).

(3) Observations of stellar displacements due to the observer being carried, by the earth's revolution round the sun, across the earth's orbit every six months, thus measuring the stars' distances from us (stellar parallax).

The force that attracted him to these three researches was the acknowledged difficulty and refinement of the necessary observations, and his belief in himself.

Probably it never occurred to him how intimately these were connected. If we take a broad outlook upon what he actually accomplished in these three directions we cannot fail to be impressed by the completeness of his undertaking. For his own measurements alone, and those under his immediate control, furnished the materials for measuring the distances of many stars, in metres, and comparing these distances *directly* with the actual metallic bar which is preserved at Paris as the standard metre.

That he should have been the first systematically to attack the stellar distances, with an instrument which with his own hands and eyes he had proved to be equal to this difficult enterprise, was a splendid thing. But that he himself should have provided all the necessary steps of the measurement and triangulation, from the interior of the *Bureau des poids et des mesures* in Paris, where lies the standard metre, right on *by continuous triangulation* to α Centauri, Sirius, and a number of other stars, is a feat of measurement which has never been equalled, and is not likely ever to be surpassed.

It may have been an accidental concatenation of circumstances and temperament that led to his doing all this; it is very unlikely that he ever realized that he had accomplished the combined feat. That it was done, and done with such superlative accuracy, has evoked the enthusiasm of all astronomers.

Without dealing with details about precautions, and checks upon the work, let us look broadly at a portion of what was accomplished in these three great researches.

First, he procured a measuring bar, transported it to Paris, and measured upon it the exact length of the standard metre.

Second, he took this to South Africa to measure a base

line on the ground, a few miles long, and from this base, with a theodolite, he extended his survey by a series of triangles over an arc of meridian.

Third, latitude observations, at the two ends of this arc measured in metres, gave him the means of determining the diameter of the earth in terms of the standard metre at Paris.

Fourth, taking a definite portion of this diameter of the earth as a base line, over which he was carried by the earth's diurnal rotation, he extended his triangulation to the minor planet Victoria.¹ This gave him the scale for measuring the solar system. Thus his triangulation gave him the diameter of the earth's orbit.

Fifth and finally, he still further extended the triangulation which was begun in South Africa, and, using as a base line the diameter of the earth's orbit, over which he was carried by the earth's revolution round the sun, he completed his triangulation from the bar of metal in the Paris Bureau to the distant fixed stars.

Thus, without any extraneous help, *he measured the distances of the stars with the Paris standard metre.*

Stated thus, the stupendous nature of the triple problem captures the imagination! Meanwhile, practical astronomers, studying in sober earnest the voluminous records of the triple undertaking, are uplifted in admiration, not only at the unrivalled skill of hand and eye, not only at the mathematical instinct that guided his steps, but even more at the dogged persistence and steady effort, which enabled him to overcome every obstacle. Other astronomers have had the skill, other astronomers have had the instinct, and other astronomers have had the persistence and steady effort. There are few to whom all have been given to the degree required for the completion of this stupendous work.

¹ The Cape observations, by themselves, gave an accurate value of the solar parallax.

BOOK III

THE CHARM OF A REAL ASTRONOMER

CHAPTER XXI

THE OTHER SIDE OF THE MAN (1899-1906)

Letters to Miss Violet Markham—The years of anxiety during the war—The Royal visit—Lord Milner—Interesting visitors.

THE reader is now in a position to understand how far David Gill, the Aberdeen watchmaker, entrusted in 1879 with great opportunities, had fulfilled the first part of his self-imposed ideals, the creation at the Cape of Good Hope of a really first-class observatory.

Some notion can also already be formed as to his second ideal, to accumulate, by personal labour and superintendence, the most accurate observations possible, and a solid contribution to the determination of fundamental astronomical constants.

In the next chapter, the story of his third ideal, the creation of a colony of ardent workers, or a family party, united by almost affectionate ties, filled with good fellowship and pride in their calling, will be told.

Something must now be said of the genial influence and sound judgment which bound him to all worthy effort even outside of his observatory.

On May 24, 1900, the *Cape Argus* expressed the opinion of Cape Town on the honour (K.C.B.) conferred upon Sir David Gill in words which may surprise those who are not aware of his influence in South Africa.

Dr. Gill has earned his knighthood, not only by eminent services to science, but by equally great services to the Empire in the recent time of crisis. His singularly

independent position in the Imperial as distinguished from the Colonial Civil Service gave to him a position of unusual influence, and he used it to the best advantage.

Gill was, in political matters, not only a clear-thinking Aberdonian, but also an honourable patriotic Englishman, who had watched with shrewd judgment the self-seeking machinations of local politicians. His sound common sense in the years of the nation's trial during the S. African war were of immense value to his fellow townsmen and a help to our administrators. The later history of South Africa renders it needless to publish his general correspondence in this connexion. One incident will suffice to show the part he played throughout the crisis.

In 1899 he wrote to Mr. Merriman an appeal to face the logic of facts and his own statements as to the Bond and Krueger schemes—and to prove himself an honest English gentleman by forsaking the course into which he then seemed to be drifting.

The beginning of the reply he got runs thus—

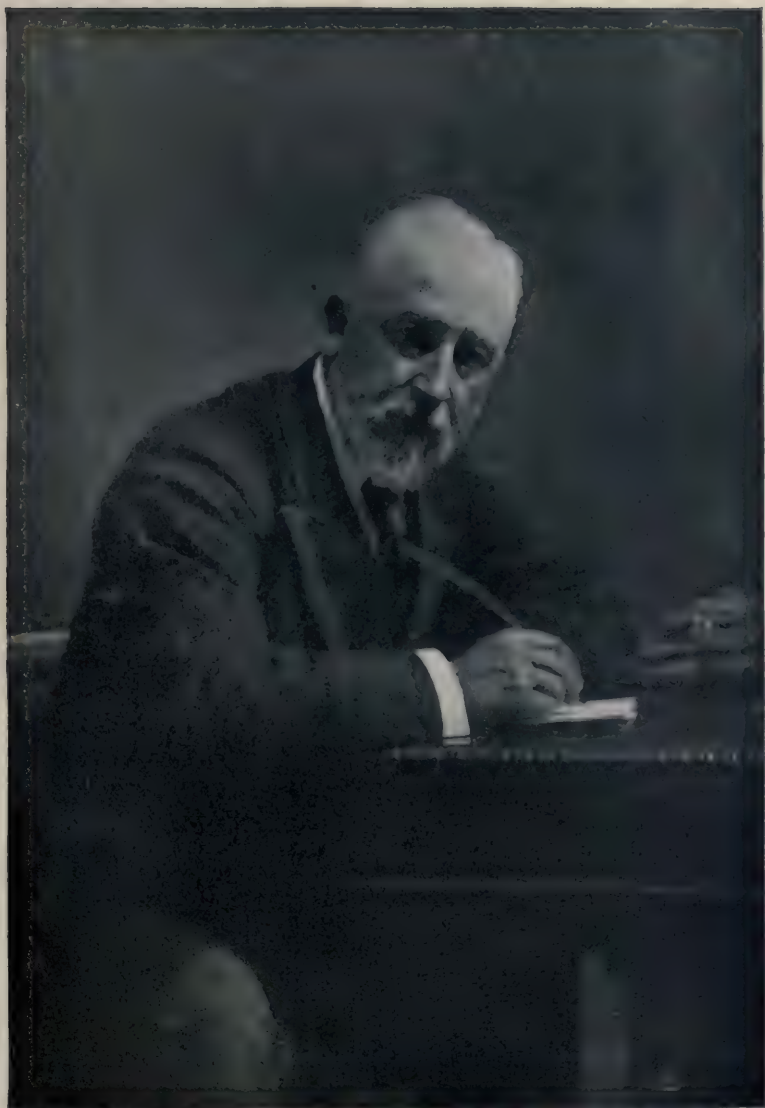
TREASURY, CAPE TOWN, *July 8, 1899.*

MY DEAR GILL,—Thank you for your kindly note. You seem to know nearly as much about politics as I do about astronomy upon which, however, I seldom give my opinion. . . .

Gill's reply to this part of the letter is worthy of the man.

MY DEAR MERRIMAN,—Thank you for your letter of this morning—but forgive me if I differ from you as to my capacity for forming an opinion on the situation.

I am not a professional politician it is true, but I may fairly claim, as a reasonably observant and intelligent inhabitant of this country for twenty years, to know very much more about its politics than you do of astronomy. You must forgive me if I go farther and say, that, being entirely uninfluenced by local party considerations, I am probably in a position to take a more unprejudiced view of the situation than yourself.



Photo, Elliot & Fry.]

[To face page 252.

SIR DAVID GILL, K.C.B., F.R.S.

Then he proceeds to deal with the inexorable logic of the argument; and concludes with an appeal to the highest instincts of his correspondent.

This aspect of Sir David Gill's activities at the Cape must not be left unnoticed. His calm and level-headed judgment was not confined to the observatory, but was at the disposal of all who had the welfare of his country at heart. It was sought and gained by all, even by the highest in that land. Few records of this part of his life, especially in the strenuous years for the colonies between 1899 and 1904, are of a character that now demand publication. But the esteem in which he—along with his loving wife—was held, is sufficiently shown by two letters from Lord Milner, one written at the moment of leaving South Africa for the last time, the other written in the last year of Sir David's life.

FROM LORD MILNER

HIGH COMMISSIONER'S OFFICE, JOHANNESBURG,
March 28, 1905.

MY DEAR GILL,—Many thanks for your very kind letter, which, alas, I have no time to answer properly.

I hope, now that I am returning to private life, you will drop my prefix, as I have dropped yours, and let us foregather in the future, as I hope we often may do, as old comrades in arms.

Thank you for all your unfailing friendship and your stout support. I am glad you think I have been of some assistance to you in your special pursuits. I am very proud if I may think that. Let me add that it has been the greatest refreshment to me to be allowed to take an interest in, and to help, however little, your work. Though I have long ceased to "wander in the groves of Academe," and my life has been wholly practical, I still owe allegiance to the world of the Higher Interests, and you are one of the few people who in this country have kept me in any sort of touch with them.

My only painful thought, where you are concerned, is regret at the continued ill health of your wife. When I remember how bright and charming she has often been in our company, and what her natural gifts are, it is

melancholy to think of them marred by this persistent illness. I hope her return home may bring better days.

With my kindest and most affectionate remembrances to you both.—I am, ever yours very sincerely, MILNER.

FROM LORD MILNER

47 DUKE STREET, S.W., November 13, 1913.

MY DEAR GILL,—I have to thank you for a most handsome gift—the *History of the Cape Observatory*, which you kindly sent to me at Sturry, and for your kind letter of Nov. 3rd. The book is full of interest for me and will always remain a cherished possession.

As for the letter, I can assure you that it is the greatest pleasure to me to find myself thus kindly remembered by an old friend and fellow-worker in the great S. African crisis of the past. I, like you, am thoroughly disgusted with latter day politics, and my thoughts turn more and more in other directions. I only wish that our paths crossed more often, but in this vast world of London—even when I am in it (and I spend as much time as I can in the country)—I but rarely come across old friends.

I am glad to hear that your health continues so good. 70 is no great age for a man of your natural vigour and elasticity, and I trust you may have many years of happy and useful activity before you.

I wish you had been able to give a better report of Lady Gill. It is most sad to know that the old cloud has once more descended upon her spirit. I have such happy recollections of her in her good moments, and always found her a true friend. Pray give her my kindest remembrances.

Once more thanking you for your friendly thought of me, Believe me, always yours very sincerely, MILNER.

It has been recognized by all who knew Sir David Gill that the social and human side of his character was as attractive as the intellectual. This appears even in his correspondence with the great astronomers of the world, who were also his affectionate friends. It is hardly possible, however, in a work of this kind, to exhibit this side of his character by reproducing many of these letters,

because they teem with technical matters of little interest to the general reader. It is, therefore, fortunate that a continuous correspondence during his later days at the Cape is preserved, with Miss Violet Markham (now Mrs. Carruthers). Her acquaintance with Sir David and Lady Gill began in 1899, extended through the terrible times of the South African war, and grew into an intimate friendship. The letters, therefore, are among the few written upon certain subjects by Gill in which all his reserve is put aside, and his inmost thoughts are laid bare.

It is very remarkable that this friend should be able to say, "During an intimate friendship of many years we discussed, I suppose, most subjects on heaven and earth, always excepting the stars."

It must be remarked that, although the following letters from Gill to Miss Violet Markham are full of sound judgments upon the policy of the war, and other matters affecting the well-being of South Africa, these opinions have been entirely omitted from the letters as quoted here, because, while they had their influence at the time, there is no use in raking up old dissensions. All of the following letters in this chapter are written from the Cape Observatory except when otherwise stated.

1900. *Jan.* 13. I'm afraid if I do go to Natal they won't hand over the command of H.M. forces to me ! . . . The proper way to relieve Natal is to compel Joubert to fall back for the defence of Pretoria. . . . But you are not an amateur general. . . . We have the cavalry camp just under the observatory windows, and you might fancy y^rself in Piccadilly from the people you meet in the observatory avenue.

1900. *Jan.* 19. [After writing about the war.] Here the irrepressible amateur General is coming out—that warns me again to stop. . . . Mrs. Hanbury is looking overworked. The Ladies Edward and Chas. are both well. I lunched with them last Saturday and took Sir

Wm. McCormack to tea with them on Sunday when I met pretty Lady Henry Bentinck. Such heaps and heaps of interesting people about.

1900. *March 6.* My dear Friend—The time for three cheers—and 10,000 hurrahs has come at last. Ladysmith relieved, Cronje and 4000 of his men captured and Kimberley open.—It has been a terrible time of excitement.

I wish I had seen you or you had been here when the news of Ladysmith came. It was only 10 a.m. I told my young men to try to work till noon, and then go—but they couldn't, and I couldn't—and at 10.30 I said, Go and hoist every bit of bunting—and get out all the guns you have, and fire a royal salute and come in to me. And this done they all came into my room, and some 25 of us drank the Queen's health and Roberts' and Kitcheners' and Buller's and French's—in my best champagne—and sang God Save the Queen—I tried to make a speech and could not¹—and we all went home or into town, to shake every one we met by the hand.

1901. *Apr. 22.* The Hely Hutchinsons are making themselves most agreeable. We dined there 2 or 3 weeks ago,—their first dinner party—a very pleasant evening—Lady Tullibardine, her sister Miss Ramsay (half-sister of the great classic) were there—both delightful. The former plays the piano charmingly, the latter delighted us with Jacobite songs.—They afterwards came and played and sang to us one day—yesterday I lunched at Muizenberg with them—and heard some really good songs that Lady T. had written. . . . The plague continues, at a slow even average. . . . We found two dead rats in the grounds—one we sent to Dr. Simpson proved to be plague stricken. This fact gave me a chance to carry out some much-needed improvements and reporting to the Admiralty afterwards. . . . My best news is that the little wife is very well. We had our first dinner party of any size for a long time on the 13th June (in lieu of the 12th,

¹ [Here is the account of his speech by an eye-witness: "He rose to speak. Not a word could he succeed in uttering. After we had waited through two minutes of expectant silence, he sat down at the table with his face between his hands, and sobbed. It was the most eloquent speech he ever made."]

my birthday)—and on the evening of the 6th July Bella is to be at home to some 300 people—to celebrate the 32^d Anniversary of our wedding day. Our new Admiral—Moore—we like much. . . . All the Cape is busy getting up steam for the approaching visit of the Royal Duke and Duchess [King George and Queen Mary]. We don't yet know whether they will pay the observatory a visit. When the Duke and his late brother visited the Cape in 1881 as midshipmen in the *Bacchante*, Lord Charles Scott, their Captain, brought them out to dinner one evening at the Observatory. They made great fun of making the Dome go round, and specially enjoyed a forbidden cigar when the Tutor was star-gazing. . . .

How delightful was the worthy reception given to our dear Lord Milner—I have written him to say that what he wants now is a good wife !

1901. *Sept.* 20. . . . I wrote an account of my holiday and . . . had it typed. I send you a copy of this "Epistle general of St. David." [The following are extracts from typed MS.]

Admiral Moore invited me to accompany him on board the Flag Ship to Natal, where we arrived a couple of days before the *Ophir*. . . .

I landed with the Admiral and 8 officers at 9.30 and waited the arrival of the Duke and Duchess at the jetty, where in a pavilion were assembled the Ministers, Chief Officials, Mayor and Town Councillors.

At 10 o'clock the tug with the Duke and Duchess and suite landed. The Admiral presented me, when the Duke said that I did not need an introduction as he had dined with me 20 years ago at the Observatory—"and a very jolly evening we had." The Duchess was charming.—I have seldom seen any one who lights up so wonderfully in speaking.

There was a slight occasional drizzle of rain, but not enough to interfere seriously with a procession in open carriages through gaily decorated Durban—then luncheon (about 100 guests) and then to Pietermaritzburg by train.

Next day a procession to the Town Hall with an opening ceremony—very impressive. . . . The Duke read his speech most effectively, every word heard throughout the large hall. Due credit to Natal's loyalty and service

—a touching allusion to Ladysmith and the Old Hundredth psalm brought a lump to the throat.

The streets were lined with 10,000 children and many hundreds of boy-Cadets and all Natal besides—a rousing welcome. In the afternoon a very fine show in the park, with investiture of a dozen V.C.'s and a lot of D.S.O.'s.

The scene was a fine one—long side rows of bronzed war-worn soldiers, with boy cadets in front of them, and facing the Duke and Duchess, 100 yards off, a row of 500 Zulus in their fullest war paint and equipment. After the investiture the Zulus advanced in a wild sort of dance forming a half moon finally—the Royal Party in the centre. It was a most weird scene—the grunts and shouts and sharp whistles of the Zulus—their waving arms and knobkerries, and the deep “ugh—ugh”—all together, were very impressive. Most impressive of all was the sudden stoppage from wild excitement. Then the Duke inspected them and, as he slowly walked past, the men of each tribe held up their hands with a deep “Incoos.”

After dinner a sort of Drawing Room at Gov^t House. . . .

One could write an amusing article on the Colonial hand-shake of the Royalty. . . . One poor man just touched the Duke's hand, lost his head and tried to vanish, but as the Duchess extended her hand some one pushed the victim towards her, he looked her in the face, shook his head in the most comical frightened way, faced about and bolted. Both Duke and Duchess looked at each other and fairly bent with laughter.

Next morning by 10.30 we were off to Durban. . . . A few hours from Natal we encountered heavy wind and sea, which rendered it impossible to arrive on Saturday evening—so we slowed down to a pace that would land us to Simons Bay on Sunday morning at daylight.

After breakfast on Sunday the Admiral and I called on board the *Ophir*. This is a small world. The Duke of Roxburgh brought me a message from my brother Jem in Australia, with whom he had been hunting with the Melbourne Hounds, and Lord Crichton had been riding a horse of Jem's.

The Governor came down to call—after we left, and the following good story came of it. The Duke asked the Governor to lunch. After luncheon Sir Walter was walking about the deck. He is one of those men who

never forget names or faces. He saw the Commander, whom he had met some years before.

Governor. "Ah, Wemyss, how are you? glad to see you."

Commander. "Yes, I think I have seen your face before, but can't remember where. What is your name?"

Governor. "My name is Hutchinson."

Commander. (Not a bit the wiser.) "Ah, yes, of course, Hutchinson, old boy. What are *you* doing out here?"

Governor. Roars of laughter.

Commander. "What are you laughing at?"

Governor. "I'm the Governor." (*Tableau.*)

On Monday, the Duke and Duchess entered Cape Town, but you have seen all this in the papers. . . .

We took rooms in the Mount Nelson Hotel during the Royal Visit to save my wife the fatigue of going to and from the Observatory. We met most of the members of the Duke's Staff in this way. . . .

Prince Alexander of Teck and the Duke of Roxburgh I knew before.

Lady Mary Lygon I was much charmed with, she made delightful music to us one evening.

The Duke of Cornwall does not seem very strong.

The Duchess was very bright and easy in conversation—and her charming manners and sweet smiles have rendered her immensely popular.

* * * * *

The Royalties departed with all the best of our good wishes and amidst the greatest enthusiasm.

1902. May 12. Only just a line. . . .

Sir Frederick Richards and I spent the week end, a fortnight ago, at Admiralty House. Lord Milner came on Sunday afternoon and stayed the night. We went up in the train together. . . . Colonel Lambton also came here to lunch the following Saturday and met Georgie Frere.

* * * * *

I am looking anxiously for next mail and news of my wife. Playfair's report by last mail was decidedly favourable, for the first time. I cabled a fortnight ago

to call in Dr. Phillips. The Kelvins had very strongly recommended him. . . . When you see Bella write and tell me all about her.¹

1902. *June 25.* I am starting on Saturday for Johannesburg to spend the first fortnight of July with Lord Milner. . . .

I saw my dear old friend L^d Methuen and his wife a good deal when here on their way home. He was very cheery and interesting. I asked him to put certain matters in writing he told me. His written statement is not so strong as what he told me—but I send it as he writes me.

Kitchener, French and Ian Hamilton passed through on Monday. The Mayor caught them for lunch by the way, and I was one of the guests to meet them, and sat by French who was very interesting.

1902. *July 22.* I have just returned from a visit to Lord Milner in Johannesburg. [Here follow notes of survey-plans completed with Lord Milner.]

All these things, besides a farewell Caledonian Society Banquet to the Marquess of Tullibardine, a Ball (at which your aged friend [*i.e.* David Gill] danced vigorously), a visit to the Robinson Mine, 2 visits to Pretoria, dinner parties at Sunnyside (Lord Milner's), and generally luncheons with pleasant people, my time was pretty fully occupied.

It was a great pleasure to meet Lady Tullibardine again, and I was very sorry not to be able to accompany her as far as the Cape on her way home. She hurried off in haste a week before me in the hopes of getting back before Tullibardine's Mother's death. She was too late after all, for the Duchess of Atholl died just as I left Johannesburg.

Tullibardine has done well with his Scottish Horse in the field and has found good posts in the Transvaal and Orange River Colony for over 600 of his men. [The remainder of letter deals with politics.]

1902. *Nov. 30.* Before Bella sailed from England I was suddenly seized with horrid pain—apparently the

¹ [Lady Gill, in 1902, was ordered home for her health for a few months. It was impossible for her husband to accompany her.]

result of a chill—biliary colic—. . . These attacks came on at night, lasted 4 to 6 hours and left one absolutely useless next day—and of little use for a day or two more. Before one was fit for real work again another attack of the same kind followed—till I had 5 or 6 of them. Dr. Beck ordered me off to Caledon where I had only one attack and I returned in 10 days to meet Bella. The evening of the day she arrived I had another attack which kept the poor little woman up till 3 in the morning. So we were both ordered off to Caledon together—remained there a fortnight—and then came back. I have only had one more attack since I came back and seem now to be over the affair.

1903. *July* 16. Lord Milner wanted me to go up to the Transvaal to advise about a despatch from home. The War Office has wakened up to the necessity for maps of British Africa S. of the Zambesi.

* * * * *

So soon therefore as the S.A. Assⁿ. for the Adv^t of Science was over—on May 4—Bella and I set off for Pretoria.

We spent six days there, stayed with Mr. Davidson the Colonial Sec^y—a most charming and hospitable man—garden party'd and dined with Sir A. Lawley (then a grass widower) with the Rose Inneses, &c., &c., and met many old Cape friends—the Solomons, &c. . . . Lord Milner came to Pretoria. . . . He apologized for not asking us to stay with him in Johannesburg as he had Mr. and Mrs. Wilson (acting Lieut. Governor at Bloemfontein) staying with him and his house full. We stayed with Herbert Baker (the Architect) a very old friend. . . . Had glorious weather and snowballs at breakfast one morning!! Bella was bright and well.

The Wilsons left Johannesburg the day before us and we joined them at Bloemfontein after a week in Jo'berg. We spent 5 happy days with them. . . . Wilson gave us the Governor's railway coach to take us to Cape Town, and we both returned well and spry from our trip.

Ten days later I started off by sea for Natal—spent a day in Durban and 5 days in Pietermaritzburg. Sir Henry McCallum, the Governor, was just recovering from enteric fever and the Chief Justice, who was acting Governor was my host. . . . Pietermaritzburg was in

the height of festivity. Cattle show, County ball, Military sports, tournaments, etc. So I had a good deal of fun with my diplomacy.

Lady McCallum is a very pretty and charming woman—with a keen sense of humour and very pleasing. We had a dance together at the ball. . . . I stopped a day and night with Lord Milner on my way home—and he seemed pleased with the results of my mission so far as they went. [Here follow remarks on political problems.]

I have been *hors de combat* for a few days with another attack of bilious colic. . . . Bella has been wonderfully well since her trip to Johannesburg.

The following two letters were written during the visit to Europe in 1904.

Hotel Bristol. Carlsbad. 1904. July 7. This is the anniversary of our wedding day—34 years ago—and we are just off for our honeymoon—to drive off to a distant point in the woods, lunch there and come back partly by water—with 2 hours walk home. The day is glorious. . . . We started away from London last Friday week, and visited Groningen, Hamburg and Berlin. From Hamburg I visited a colleague at Kiel, and from Berlin colleagues at Potsdam and Jena. Bella rested at Hamburg and Berlin whilst I was on these little vagaries. She was much interested . . . and was specially delighted with the Kapteyns at Groningen and the Repsolds at Hamburg. . . . We arrived here on Saturday last. The Doctor gives a capital account of me and thinks he will stop all tendency to my complaint in future.

Villa Victoria. Carlsbad. 1904. July 17. Our necessarily fixed plans are—Leave this for Caux or Chamounix on the 23rd Inst. Stopping one night at Munich and Zurich. We should reach London on the 14th August—go to Cambridge for the Brit. Assocⁿ meeting Aug. 17–24—Leave for Aberdeen the 24th—where a friend is keeping a bit of his moor for me. . . . We must have about a fortnight in London before we sail—say Sept. to Oct. 5, and then we go for a couple of days to the Hunt Grubbes at the Isle of Wight, and go on board from there Oct. 8.

1905. *March 12.* There has been an enormous amount of work connected with the B.A. visit in Aug^t—7 different centres to be visited and all sorts of difficulties to be overcome, jealousies to be appeased and so forth—endless correspondence with local committees, governments, railways, Mayors, etc. So that I required a few days holiday and went off just a week ago to Beaufort West to shoot buck with Mr. Alhusen. We had three days capital sport and I returned on Friday evening—as fit as a fiddle. . . .

I had a letter last mail from Lord Grey in which he writes me in enthusiastic terms about the Hanbury Williams—He says, “Hanbury Williams¹ your Nominee first rate, wife ditto, no trouble too great and lots of tact.” He wants us to pay them a visit in Canada. If only the little wife gets well; it would be a very jolly trip after we leave this.

When do you go to Canada? I w^d like to send you a letter to Lady Grey and write to Lord Grey about you at the proper time.

1905. *Good Friday.* Yes—I think we are all pleased about Lord Selborne’s appointment. . . . Lord Milner *had* to have a rest. . . .

I had such a charming letter of Good-bye, written 3 days before he left.—How he found time to do it I don’t know—but there it was full of loving friendship, and looking forward to the time when we should “fight our battles over again” in the old country. And so on with all sorts of kind things about my wife.

The Kiplings went home the mail before last. . . . Rudyard was very well. . . . He says he has written an astronomical story which he dreads my getting hold of. It is published in some American Magazine—if you get hold of it—try—and send it to me.

Dr. Jem is doing wonders—he has got his Compulsory Education Bill through the House.

I don’t like his plan of submitting his Estimates to a select committee of both sides of the house, but he says he likes his plan—it saves him the unpopularity of cutting down, because he can blame the Committee—and retrenchment was necessary. On the other hand he says

¹ [Sir John Hanbury Williams.]

that he will neglect the Committee's recommendations when he sees it necessary, and will ask the house to support him.

1905. *May* 13. . . . but first I want to tell you a bit of good news.

The little wife is decidedly better, and has been going on progressively in this direction for nearly a fortnight, with only one little set back for a day or two.

On Saturday of last week we both went to Muizenberg for a little change, spent a quiet evening at the Hotel after a quiet walk by the sea. I went on to lunch at Admiralty House on Sunday and Bella came on to pay her first call and have tea—returned to Muizenberg and on Monday morning accompanied me back to the Observatory. [And so on about his wife's activity.] God grant a good time is coming to her, for she has suffered terribly. [The rest of the letter is devoted to the Education question in S. Africa.] . . .

1906. *July* 2. [The letter begins with Cape politics.] But I am getting rid of political bile—just by way of relief—for I am sad and sore.

My dear wife is very ill. She had been getting worse and worse for three weeks—and tho' I hope and believe the worst is now past, I know it will take a long time before the nervous system can recover tone. . . . I am awfully busy trying to complete the work I have in hand before we go.

I suppose you know that I have to be President of the British Assocⁿ next year. I have also to serve as the representative of England on the Committee of the international Bureau of weights and measures. I have promised some articles for the new edition of the *Encyclopedia Britannica*, etc. etc.—and I am not likely to lead an idle life at home.

I am so glad you went to the Milner banquet—I wish I could have been there. His speech read admirably—tho' I remember his saying, "public speaking is not among my many accomplishments"—and his delivery is far from perfect.

I am so glad to hear Lord Milner has been to see you. What a good time you must have had. Plato and Greek philosophy I know little about—but from the little I do

know I like to tell the present day philosophers that they have got no "farrarder" since the days of Plato—and it makes them so angry that I am sure it must be true. . . .

Do read my friend Oliver's book on Alexander Hamilton—one of the greatest of Americans. He calls it an *Essay on American Union*—but you w^d, and I did, enjoy every word of it.

CHAPTER XXII

STAFF ANECDOTES

TRULY Clerk Maxwell was right (p. 235), and David Gill was happy in his work. But his happiness reached its climax from his personal relations with mankind, the inevitable reward of his selfless love for his fellows. And here he attained the third and crowning ideal of the perfect observatory; the creation of a spirit of devotion and united zeal in work, combined with affection in lighter moments, between the staff and their Chief, supported by his amiable wife.

Some attempt will now be made to give a picture of the observatory from the point of view of the Staff. All great institutions governed by an outstanding personality give birth to tales about the Chief. Whewell and Airy each had their foibles and peculiarities told in tales, some true, others invented.

Some of those told about Gill may be mythical, but most are true and all are typical. A considerable number of anecdotes have been received from old workers at the observatory. None can compare, in number or appropriateness, with those furnished by Mr. John Power, who seems to have reached a closer intimacy with the real personality of his Chief than any one else in the observatory.

One of these men writes—

He not only made the Cape Observatory renowned throughout the scientific world, but he made of its staff and of their families quite a little world of its own, a happy family.

Gill's day work was done in the large room which he used as a study. It is now the drawing-room of his successor. In the corner occupied by him there was a large table in great disorder, about which we are told—

His office table was a constant source of worry to his wife and his secretary, and his method of finding a letter was to toss everything about until it came to hand. Then followed the same process to find the paper he was working with. One day, at the secretary's suggestion there came a general tidy up, and the institution of a system of baskets for different classes of papers. This only served as a grievance. He said that he could not find things so easily; but perhaps the truth was, he objected to the ever present evidence, accusing him of delay in answering letters not immediately concerned with the work in hand.

Still, we got the Table perfectly tidy on one occasion. He needed a change badly but would not listen to advice. An assistant asked if he knew he was worrying Lady Gill by not taking the change.—This settled matters in a moment and he left for Simons Town the next day on a long promised visit to the Admiral, and went on to Seapoint from which he returned with a diphtheritic sore-throat, and was confined to bed by an anxious wife. In his absence the table had been thoroughly tidied; and, after his recovery, his wife never wished to see it tidy again.

Concerning this illness which fortunately left none of the usual bad results, Sir William Morris, R.E., writing from Chatham about 1895, recalls his own happy life in South Africa and says, referring to Gill's recovery from diphtheria—

I can vividly imagine your wife's mental disturbance on your falling a prey to that fell disease, mildly though you had it. How she must have missed her delight in reading to you and in seeing you sitting there puffing away contentedly and delightedly at your pipe. I see the dear remembered scene well enough and have often and sincerely wished I could wake to find myself in your study, where all breathed peace and rest.

When Dr. Auwers first saw Gill's writing-table, his exclamation was, "Ach ! what a table !" But after a short pause he added, " Nevertheless, what good work has been done at it ! "

For the first sixteen years of his residence, except at certain times, Gill carried on his correspondence himself. When it became necessary to have a secretary in his room his habits and moods were noted without his being conscious of it. It is told that—

However deeply he might be engaged upon a problem—he would then be seated at his desk with his feet shuffling—if any one came up to him with even a paltry question, he would look up smiling and attend straight off.

Many people thought that things not remarked on escaped his notice, but really he prided himself on having " a genius for not seeing things which were better not seen."

Another assistant speaks similarly of his behaviour when at his desk, saying—

Gill wrote *very* rapidly (more so than any member of his staff) ; and during the time that he was his own secretary many of his own press copies of letters are too smudged to be readable. When an assistant came to consult him while letter writing he usually stopped instantly. But occasionally he spoke while still thinking of what he was writing. On one of these occasions a computer asked to leave at once on receiving a wire saying his fiancée was ill. Without looking up, he replied, " Yes ! Yes ! but tell her not to let it occur again, as it interferes with work." The computer endeavoured to sting with sarcasm by suggesting that on the next occasion the lady should wire to Gill. The answer came promptly, " Yes, yes, and tell her to state fully what is the matter." He had spoken while thinking nothing of the affair, and was highly amused later on when told what he had said.

On another occasion when engrossed in reading an assistant began his mission by saying, " In his introduction X—— says——." He was at once interrupted

by the most emphatic assurance that X—— was a “damn liar.” Knowing the chief, he answered, “That may be; but here he is truthful,” and placed the Introduction on the paper Gill was reading. This banished the article and brought him from the clouds; the question at issue was settled and the final words were, “No. X—— is not a damn liar.”

Similarly, a secretary has a story of him, and says—

Although he had a remarkable command of temper, he was explosive. I remember he was reading a memoir by an astronomical opponent one day and I heard him muttering, “Liar,” “Damned liar,” “Shameful,” “Ought to be shot,” “Quite right,” “Very good,” “Excellent.” Then he threw the paper over to me saying, “Excellent paper by ——.” He was incapable of malice or revenge, absolutely.

Such of these stories (and of those which follow) as are true indicate minor traits in the man’s character; and, whether true or not, they are all illuminating as showing the kind of stories that his staff thought might be true of him.

One of those who studied at the observatory writes: “In my case I measured others by what they thought of him; that is perhaps as great a tribute to him as I could offer.”

In 1891 after much delay in starting the astrographic telescope, Gill brought from home the altered object-glass. A few days later a pure accident stripped the teeth of a wheel. He dreaded the further delay in starting work as the repairs must be done in England. A newly arrived Secretary was astounded by a monologue of Gill, the Photographer and Secretary being audience. The fresh hand slipped out to learn from an older assistant what had happened. On returning, the monologue was going strong, so, motioning to the Photographer to leave the room, he ventured to suggest that perhaps the work could be done at the railway workshops at Salt River (a mile away). In the next few minutes the Secretary learned something about the ignorance of any man who

had been here only two days, and about the ways of railway workmen with astronomical instruments. The monologue continued until the Secretary began to wonder whether the Chief now considered him as cause of the accident, *vice* the equally guiltless Photographer who had retired. After a time the Secretary decided to try a diversion, proposing that it might be well to begin packing up the thing for transit to England. This proved a text for an eloquent lecture on indifference, the evils of calmness and various other supposed sins of people who could make such a suggestion. Finally the Secretary, with an aggrieved air, hinted that a listener would have thought at first that the Photographer, and later that the Secretary, had purposely done the damage. Gill glared for a moment, the frown gave way to a smile and, with a hand on the Secretary's shoulder, he exclaimed, "Good Lord, was I as bad as that?" In two minutes it was decided to try if Salt River would undertake it. The Photographer entering, started on explanations, but was silenced with, "I know. Just forget all about it."

Later the newcomer had to tell the story to the assembled staff who thoroughly enjoyed it, and congratulated him upon his good fortune in bagging such a typical incident so soon after arrival.

Those who knew Gill sometimes enjoyed the storms for the prospect of the fine weather which always followed.

The shoulder grip was a favourite trick and one hard to resist. Some of his staff were always careful to keep at a distance when it was necessary to avoid giving in to him. Once during a heated discussion it was necessary to insist on his withdrawal of a statement made. He knew that this could be avoided if he could get his persuasive hand on the other man's shoulder—so did the other man. The result was a kind of waltz three times round the large study, avoidance of the grip, and withdrawal as complete as could be desired.

Rates of pay for certain work often led to amusing episodes; that for taking certain photographs was fixed at 6*d.*, but the men (two Greenwich men) considered it should be raised to 9*d.* and after several indabas decided to refuse to work for less. This evidence of the supposed sordidness decided him to keep to the original sum, and

among other expedients he tried to get the Artificer who was a good photographer to do the work. He, knowing nothing of the dispute, started, but, hearing of what had happened, found he could not master the details. An indaba with the two "strikers" followed. Very strong views were expressed, the Chief saying he would like to give them £500 a year each, and the strikers repudiating a desire for anything beyond 9d. a plate. Later in the day the Chief was on his way to the railway station with a striker on each arm.

In his own private affairs he seems to have been careless. One who used to be his secretary says—

He thought all were straight runners and was therefore easy to deceive, and was always surprised when he found he was deceived.—I kept his petty cash and some of his other accounts. He never queried any—it was a mere form—sometimes I thought a private bill was stiff and would say so—he might agree, but just wrote out his cheque without a further word.

He had a high sense of duty, yet he did not like to find fault. When he had to do with a slacker he was very unhappy. He disliked cutting the Gordian knot. Yet in the long run unless work improved it would be cut. He was so easy to get on with, so unsuspecting, so kind, that it needed a real perversity to be out of tune with him. If any one did his best and it was *bad* he was content—he would fit the work to the man.

Continuing with Mr. Power's reminiscences—

Woe betide the man who neglected to mention illness or trouble. It was regarded as most unkind to him and his wife who were always most keenly interested in all connected with the place. When one of the men found that what seemed a good salary in England was starvation at the Cape he asked Gill's advice as to buying or building a house as the rents were then out of all proportion to the cost of the houses. The man's intention was to obtain the balance of the money from England. Gill went into the question, and when he had examined the pros and cons was enthusiastically in favour of building, exclaiming in the most emphatic way, "Buy the ground and build at once." He brushed aside the idea of the delay in

getting the money from England with, "D—n it, man, I have the money." The man had not been long in his service and regarded the assertion as one of his impetuous sayings, but, four days later, was surprised by the abrupt statement that from a certain date the required sum would be at his disposal while the house was under construction. The Chief and Lady Gill took the keenest interest and twice a week they walked down to watch its progress.

From the Observatory to the Railway Station is about eight minutes' walk on an Admiralty road. On this road he was seldom alone, for old and young either waited for or overtook him. The youngsters especially enjoyed the walk with him, as he entered into their doings like one of themselves and always had a cheery word of encouragement or some amusing yarns to tell them.

His idea of the position of Chief and Staff probably agreed with his wife's expression of it, "We are a small colony of exiles, and I like to feel we are one family."

They both acted on the "one family" principle, and the success of the Observatory under his direction was due largely to the reciprocation of their feelings. He certainly had enthusiasm, energy and what an Irishman calls "a way with him," but all these would not account for the spirit in which work was done.—His wife shared in bringing out what was best in the men, and giving them the feeling that the credit of the Observatory was a family affair as well as a national one.

Many years ago the assistants made a croquet ground for Mrs. Gill. Later she wanted bazaars for worthy objects. The whole staff waxed enthusiastic, and men, women and children did their utmost. Perhaps the best incident illustrative of her influence was that in which a Jew and a Roman Catholic were selling tickets to wipe out the debt on an English Church. The Jew was charging double the proper price, and when remonstrated with remarked, "Lady Gill wants money and I will see that she gets it."

Gill was rather unconventional at times. He seldom carried an umbrella and, when he did, invariably came home without it.

After one trip to England he returned with a clerical

looking overcoat, and on being questioned blamed "some clerical Fellow of the R.A.S." for taking his coat.

He had all Dominie Sampson's affection for old clothes or indifference to appearances. An old friend who was in the house when Lady Gill was absent for a few days was considerably worried because he persisted in wearing a certain "comfortable" suit; all her efforts to effect a change having failed she sought the assistance of one of his men. It was arranged that the first of two men who saw him should tackle the business. The opportunity soon came and the Astronomer found one of the Assistants scrutinizing him in a way that forced the query if anything was wrong. The reply was, "I should think so—you ought to change that suit at once, it is far from beastly respectable." (An expression usually applied by Gill to a new suit.) He attempted to defend the old one, but was answered with a scathing analysis of it and the assurance that his wife would not permit him to wear such a thing. This settled the question and the offending suit disappeared and was seen no more.¹

He had a weakness for assisting stray callers in distress, especially if they were Scottish, or well educated. One man turned up with a piteous tale and among other items mentioned that he could speak and write Persian. After handing the man over to Lady Gill to be fed and given work he returned to his study in a very miserable state and overflowing with sympathy. He admired the appearance of the man;—a member of his staff did not, and was rebuked for his harsh judgment of an educated man who, even with the ability to speak several languages including Persian, could not secure work. The assistant promptly asked what evidence there was for the Persian, *e. g.* did the Chief know enough of the language to verify the statement. He did not wait for the complete answer, but left hurriedly.

For some days Lady Gill had good evidence that the fellow was a waster, but it was only when the Civil Engineer from Simons Town saw the man and gave the story of his loafing there that the Chief was reluctantly convinced.

On several occasions he was imposed upon in this way. He would give a man employment and advance him

¹ [It must not be supposed that such freedom was allowed to all of his subordinates.]

money out of his own pocket. Generally the case was forgotten with the reflexion, "Poor body! I would rather be robbed over and over again, than miss helping one real case of distress."

Men in his position in S. Africa have many visits from newcomers seeking advice or help. No trouble was too great if he could help any one.

It has been noted that Sir David was particularly hospitable to his own countrymen, to whom his own broad Aberdonian accent was usually a great charm. Mr. E. B. Knobel visited the Gills at the Cape in 1892, and sends this anecdote—

One day a Scottish gentleman from Paisley landed at Cape Town. Gill invited him to lunch. In the course of the repast a rather animated conversation ensued between them: The Paisley gentleman spoke with the broadest accent of that part of Scotland, and in the heat of the discussion Gill's Aberdonian became more vigorous. I do not think the Paisley man understood him, for at last he said, "You're not a Scotsman, are you?" which convulsed Gill and drove me from the table to enjoy the joke with Lady Gill.

Tom Peasoup. One of the Kroomen was a most intelligent faithful fellow, and often assisted the Chief in cleaning and re-erecting instruments. Tom would do anything to avoid Massa's displeasure.

Peasoup came on one occasion to Lady Gill begging her to get him leave to go away to his brother's funeral.

— Why don't you ask leave of your master?

— I done that.

— And what did your master say?

— He say—"I'm getting tired of these dam funerals."

One of the less permanent members of the staff writes—

His politics so far as we could grasp were of the old crusted Tory type, but he often quoted B. A. Gould's saying that the best party in Argentina was that which did most for the observatory and for science.

On one occasion he launched out on a Home Rule discussion with an ardent Home Ruler of whose opinions

he was not aware. The discussion was rather brief because after a while he admitted that his study of the Irish question was practically confined to a chat with Lord Kelvin and concluded that "politics was a dirty trade," and both parties to the discussion would be better employed on their astronomical work.

An enthusiastic Imperialist, the S. African War troubled him greatly. He was very outspoken on several occasions. A leading politician who praised his outspokenness must have been surprised to hear that he and his party ought to be ashamed of their silence. He really suffered intensely during the war and actually wept while reading or speaking of the casualties on both sides.

Asked by the Colonial Government to visit Kimberley in connexion with Survey matters he arranged with the Surveyor General that his expenses should be paid, and to avoid the bother of keeping accounts the expenses were to be the difference between the amounts in his pocket on starting and returning. This account was duly rendered, but they tendered a sum larger by about £6 arrived at by giving the daily allowance of a Colonial Civil Servant. He regarded this as an insult to his Office and sought the Railway Time Table vowing vengeance. We thought he was pacified and content to write on the subject, but he slipped off by a later train and came back happy, with a cheque for the smaller sum and the satisfaction of having explained that the Astronomer took no remuneration beyond his salary from the Admiralty.

In early days his go-ahead ideas were somewhat disturbing to officials at home. Any visitor from England was charged with messages for his guidance—such as to deal with each subject in a separate letter, or to ask for one thing at a time, etc. It was often necessary for Admiral Wharton to warn him of the effect of his methods on the official mind, and the possible bad effects on the Observatory; the unsparing plainness of the Admiral's letters was much appreciated, and Gill's usual remark on reading a somewhat merciless chiding was—"A friend who will hit like that is worth having." On one occasion he wrote, "There is no proof of friendship more sincere than one which involves trouble to tell a friend the truth—especially if it is an unpleasant truth. Therefore, no

apology is needed for your remarks. If you will always tell me as frankly what you think and caution me as wisely, I shall be very grateful and shall always as frankly confess my sins or defend my opinions." It need hardly be added that there was more defence of opinions than confession of sins.

Once, when some one complained of an apparently unkind remark, he sadly said, "To think that you have been with me for years and don't know yet that I don't mean what I say!"

Very few trains stopped at Observatory in the 'eighties, and he was anxious that the last train should stop "on signal" to pick up one of his observers who lived at Wynberg. The railways are run by Government, so he approached the responsible Minister, who refused the request. A persuasive letter followed which, after reciting what the Observatory had done for Cape Colony, showed how easily the Government could assist the Observatory.—Refusal of his small request would be taken as an intimation that he need send no time-signals in future.—The request was granted.

Many of the incidents narrated in Mr. Power's notes disclose a certain joy of encounter with the professional scribes of the Admiralty, and a delight in taking advantage of a false move.

He was reported to Parliament by the Audit Department for not furnishing a complete list of instruments, books, etc. Officials in England who had no idea of his difficulties could not be expected to understand his difficulty in complying with such a request. He took the view that, until given the staff necessary to do this work it could not be done without sacrificing astronomical duties. In 1891 he was given a secretary one of whose duties was to prepare the lists and be answerable for the property; but the secretary refused to accept responsibility until given proper provision for storage. Now, for years, Gill had been anxious to convert the central hall into a properly fitted library instead of having the books scattered in different rooms on open shelves, but feared to ask money for such a purpose. He was quick

to seize this lever for carrying out the project. The report to Parliament had not troubled him in the least, but suddenly he made it a serious matter. Delays in granting the request for shelving, etc., were given as reasons for the impossibility of making the lists.

He could ill brook the delaying at home of well thought out projects, and any member of the staff who went to him directly after the mail had brought such news was expected to sympathize. His proposition to fix the meridian marks for his Transit Circle on the solid rock many feet below ground level had been criticized and the suggestion made that, if other observatories could use points on church steeples or public buildings, the Cape should do the same. (The particular observatory cited is in a neighbourhood bursting with such buildings, while there are none at the Cape.) The first entrant was told the proposition and asked what should be done to its author. He handed the letter back suggesting that the "mark" estimate should be withdrawn, and one for the building of a couple of cathedrals substituted, with a note that they would not be a success, and the marks would have to be erected later as proposed. This cheered him up. He resolved to do it—and he did it! (unofficially, of course). The marks were eventually sanctioned and have revolutionized the work with the principal instrument of the observatory.

In Maclear's day there were very few houses near the observatory, and he was regarded as the natural leader in all local movements. Gill succeeded to this position, when the place was more densely populated. One of the public meetings over which he was called on to preside is described by Mr. Power.

Local option was in force, but the sudden growth of the village left the voting power in the hands of people living miles away, so residents held a public meeting. Gill was chairman and naïvely remarked that he "liked a little liquor himself"; and when a supporter of the request for the license thought he had put an unanswerable poser by asking what people were to do in case of a sudden need of spirits, for illness, Gill answered blandly, "Just send to me, or any of these gentlemen on the platform."

A story comes from one of the men who passed through the Observatory training and went on to do good work in another colony. He sends it as an example of absence of mind on Gill's part. It may seem to those who knew him better to be Gill's answer to a youngster who had the temerity to fancy himself as a possible observer with the great heliometer.

I was one evening reading the declination microscopes of the Transit Circle when Sir David came in, and I plucked up courage to tell him of my ambition to work with the Heliometer. No sooner had I got the words out of my mouth than he bellowed, "You want to observe with the Heliometer?" (I thought my last hour had come.) "So you shall—so you shall. Come up to-morrow night and I'll teach you how to." My relief was too great for words. I certainly went home that night feeling that my career as an astronomer had begun.

The following evening, punctually at 6 p.m. I went to the "old man's" study and reminded him that he was going to teach me to use the Heliometer.

"Right!" said Sir David. "Go and set it on α Centauri and I'll come along."

In about a quarter of an hour Sir David came in to the Heliometer, sat down on the observing chair, turned a few mysterious handles, and said, "Well, there you are. Dreadfully bad definition, perfectly damnable, but just you observe the distance of the components, and let me see the result to-morrow."

With that he stalked out, and there ended my lesson in observing with the Heliometer! I am quite sure he did not realize what he had come for, or that he had set me to make one of the most difficult observations ever made with that instrument.

When Gill retired there was no difficulty about the appointment of his successor. When Mr. Hough was selected as Chief Assistant in 1898, Sir David had insisted that a candidate should be selected who might eventually succeed him. But who was to succeed Mr. Hough?

Gill was most anxious that it should be some one

qualified by past work to make the most of Mr. McClean's gift of the Victoria Telescope in the measurement of radial velocities. The fine work already accomplished in this direction by Dr. Halm at the Edinburgh Observatory eventually secured him the appointment.

On Dr. Halm's arrival at the Cape he wrote to Sir David his impressions of the scene of his future life's work.

FROM DR. HALM

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,

August 12, 1907.

DEAR SIR DAVID,—Now that the first bewildering impressions have been somewhat cleared and I begin to feel at home in the new sphere of work and among my new friends and colleagues, I must not longer hesitate to send you this first message to tell you of our happy settlement in this most beautiful place as well as of the first events of my initiation as Chief Assistant of your great Observatory.

Needless to say that I received most friendly welcome from Mr. Hough and all the colleagues, who did all in their power to help us in our first domestic difficulties and to assist me in obtaining a speedy knowledge of the equipment and the general work of the Observatory. They are an excellent set of men, faithful to their duties, frank in their opinions and loyal to the good old traditions of the Cape Observatory. My estimation of their character is securely based on the all-round expression of their admiration for their late Chief, for his work and his personal kindness, his fatherly interest in them and theirs. Great and imperishable is the scientific monument you have left behind, but it is overpassed by the monument of love in the hearts of those who will for ever remember your and Lady Gill's kindness and sympathies with their joys and sorrows.

* * * * *

Believe me, Yours very sincerely,

J. HALM.

CHAPTER XXIII

PERSONAL TRAITS AND TASTES

The personal side of David Gill—Art—Literature—Music—Religion, etc.

OF the two forces, one of the head, the other of the heart, which governed all the acts of David Gill, perhaps too much prominence has been given to the former. This was inevitable in the circumstances. The Violet Markham letters, however, and the Staff anecdotes, give a great insight into the other part of his outlook upon the world. It will be not amiss to insert here some notes and anecdotes received upon the subjects of Literature, Art, Music, Religion, Humour, Conversation, Sport, and other social matters.

Reference has already been made to Gill's love of pictures, and the many artists whose acquaintance he had made in Scotland and in London. He had many pictures in his house, some of which he rated highly.

His oldest artist friend was Sir George Reid, who used to walk out from Aberdeen in the 'seventies to visit the Gills at Dun Echt, and who was a member of the literary coterie at Old Deer Manse, to which Gill contributed his share. Some of the acquaintances of this President of the Royal Scottish Academy generally recall him as a gloomy, morose man. These will be surprised to learn that he was in the habit of unbosoming himself to his old friend, David Gill, in a spirit of fun and drollery combined with culture, and his letters were often accompanied by comic sketches.

Mr. A. P. Trotter, who spent some years at Cape Town, sends the following amusing tale, which is true.

Charles Keane once sent Sir David a clever pen-and-ink sketch on a sheet of note-paper. It was probably mounted or framed, for it came under the notice of the Customs authorities, and when he extolled its merits they mulcted him in a good round sum.

Many years after Sir George Reid sent him a beautiful picture of a mass of roses as a present. [Many a reader will remember this picture in Lady Gill's drawing-room.] Sir David was asked, as was the practice at Cape Town, to pay a visit to the office to declare its value. He said, "How should I know anything about the value of pictures? I suppose it is hand painted. What do you think? You must have much more experience than I. Of course, I will pay whatever is right." "Well, it seems to have a very good frame—that is worth a pound." "Yes, now you mention it, it is quite a nice frame, and if you say a pound, that is all right. And I suppose something must be added for the picture?" So he was charged on a value, declared by the officer, of 30/-.

The tale has been told with little change by others. It gives additional interest to two letters out of a bundle written by Sir George Reid to Gill.

FROM SIR GEORGE W. REID, P.R.S.A.

22 ROYAL TERRACE, EDINBURGH,
November 13, 1891.

DEAR ASTRONOMER,—When I recognized your handwriting on the envelope and the pinky-purple-Cape-of-Good-Hope-two-pence-halfpenny-stamp, I felt glad—but when I turned the envelope to tear it open and my eyes lighted on the words, "What about my roses?" I felt a slight shock—of pain, or of shame, or of both, it may be, as I knew I had no answer—or at least no satisfactory answer, to return to your question, "What about my roses?" Well—what am I to say about them? They have bloomed and faded and fallen petal by petal to the earth, and I have been unable to make any record of their brightness or beauty—but instead, went on looking day after day on the bald shining head of old Dr. G—,

and never once thought of the "gather your rosebuds while you may, old Time is still a-flying" exhalation, and now in the gloom and fog of November I look back sorrowfully on lost chances and wasted opportunities. Vorbei! Vorbei! sagte der arme Mahler, hatte ich doch Blumen gemahlt, als ich es noch Konnte, Vorbei! vorbei!—which, slightly altered from Hans Andersen, may be given as a fair rendering of what my repentant and regretful feelings are. But be of Good Hope! (as you are).

Yes, David, yes. The Gloire's flower
Again shall deck the summer (seat) bower,
Again my garden shall supply
Things pleasant both to mouth and eye;
Roses and Poppies shall abound,
With Pinks and Pansies all around,
And when the Painter paints at "they"
Too short shall seem the summer day.

With which free rendering of Sir Walter I shall cease and determine from this Rose business for just now.

About this Presidency. I really don't know whether or not I have acted altogether wisely in accepting it. I wish you were an astrologer or a Taustettor—or a Copernicus—or a Galileo—or a Tycho Brahe or something of that kind, to consult the stars for me and tell me whether I was under the influence of some good or evil one when I said "yes" to the question. But the days of seers and soothsayers and Prophets and users of divination are past, and most of us can see before us just as far as the points of our noses and little further, and I must e'en be content to remain in doubt and uncertainty. Time doubtless will solve the mystery—but then, if it should prove to have been a mistake!

However, the thing is done "for better or for worse"—as the saying is—and I must make the best of it. It will add to my cares—and to my worries too—

"For how much there is lacking what tongue can tell?
And of things that are crooked the number is fell,"

and this is an untoward generation—and if you have to persuade long-eared quadrupeds who "won't go"—"wolloping" is of little use—persuasion in the shape of carrots—or by preference thistles—is the only thing—

and it may "exhaust time and encroach upon eternity" before appreciable advance is made. Still, I am not altogether without hope. . . .

How is Mrs. Gill? Please give her my kindest remembrances and regards—and my wife's also. I hope you are prospering in—I was going to write "the work of your hands"—but I suppose I should say the "work of your eyes"—and of that funny calculating machine—the one you used to turn by a handle. If I had much to do with arithmetic I think I should get one. I never could learn the multiplication table—as Pet Marjorie used to say of nine times nine—it was "dampnable"—I am afraid I have written you a sad teaser—but I shall send it nevertheless. Yours ever truly, GEO. REID.

The promise of the harassed President R. S. A. having been duly kept, Sir George's next letter, dated April 26, 1894, begins—

DEAR ASTRONOMER,—I am glad the roses reached you safely and that you like them, and further that the Custom House officials have been so moderate in their valuation of them!

The home of the Gills always contained good pictures upon the walls, some by his own friends, others collected by himself. I remember, in 1902, taking the late Earl of Carlisle out to the Observatory, and the great interest with which he gave to Sir David the benefit of his critical knowledge of the old Spanish masters. Gill's old Spanish pictures were sold at Christie's after his death.

With regard to literature, the reader must have noticed, in numerous references by correspondents in these pages, the keen delight with which he devoured the work of our best authors. Allusion has also been made to a few occasions when he read aloud to his friends, and to the daily readings by his wife, which were his great recreation during forty years of their married life, during some hour of rest, while he contentedly smoked his pipe and listened.

The outstanding feature of David Gill's personality was happiness. In work or play, in action or inaction, it beamed from him. He was happy when engaged upon the work of his favourite science. He was happy in joining in the games or sports of others. He was happy in seeing others happy, and was happy in sacrificing himself for those he loved. But few things outside of his pet subject brought him such supreme, contented happiness as really good music. This was noted in letters even during his Clerkenwell days. It never ceased to please.

Mr. R. T. A. Innes, writing about Gill's characteristics, says: "He liked music, but a wrong note gave him anguish—so that his enjoyment of music was always very mixed."

The observatory, during the whole period of the Gills' residence there, was the meeting ground of all intellectual and artistic residents, of all distinguished visitors to Cape Town, and of the naval officers at Simons Bay.

All the professional musicians who arrived at the Cape were well received at the Observatory, and there were many musical evenings. Among the residents there were some, like Mrs. Colahan, an army-doctor's wife, who were skilled performers, and who often came to brighten the observatory life with music, on the piano whose quality was unimpeachable.

Once, when Mrs. Colahan was playing, two young girls seated together in the room were talking. Sir David admonished them in a whisper. Shortly after, they resumed their conversation, whereupon he approached them, took them each by an arm and solemnly removed them from the room.

From that time onwards the pianist nicknamed him her "musical policeman."

Mr. Knobel recalls that when he was at the Cape he and Mrs. Colahan on two or three occasions played the Kreutzer Sonata. He says, "Gill was so moved, he

almost shouted his delight, and afterwards he often referred to the exquisite slow movement in Beethoven's masterpiece."

When Madame Norman Neruda and her husband, Sir Charles Hallé, were guests one evening, they were given a peep at the stars through the big telescope. Sir David's explanations evoked her enthusiasm, and she exclaimed, "I must stop here always." Whereupon her husband asked, "And what is to become of me?" "Oh, you can stop too—if you like."

Remenyi the violinist, Albani, and many other noted artistes found their way to the observatory.

Santley was a welcome friend there at all times during his trip to South Africa. Once he was singing "Duncan Grey" at a concert in Cape Town, and Sir David had his seat on the platform. Each verse excited him more than the last, and, oblivious of all but the song, at the close of each verse he pushed back his chair a little to catch the sound better, until, to the horror of his wife, who sat in the body of the hall, he was within a few inches of the stair leading down from the platform. Had there been one more verse he must have turned a somersault down the steps, and all his friends were relieved when the song ended without a catastrophe.

In the presence of really good music he was almost beside himself with joy. During his frequent visits to Paris he saw a good deal of the Lyttons. One day they took him to a concert with their party. An exquisite solo was being sung, and Gill was enchanted. He seized hold of an aged gentleman of the party, who was next to him, by the arm, and said, "Man! is it not grand?" Some time later Lady Lytton, when spoken to about it, remarked, "Yes, the Duc [indicating a high personage] was greatly amused at Sir David's enthusiasm." Our astronomer had never given a thought to his neighbour, whether he was great or small. He felt he must have sympathy in his admiration of the solo.

During the whole of his residence in England, after his retirement, Gill never missed an opportunity of attending the Albert Hall concerts.

Mrs. Andrew (late of Cape Town and Muizenberg, now in Scotland) writes—

Not very long before his last illness, we were coming out of the Albert Hall, after a performance of the *Elijah* and, in the vestibule, met a "rapt" Sir David, who declaimed in his broad Doric, "Ah, Mrs. Andrew, Mendelssohn was all wrong in his wind-up. He should have finished by sending Elijah up to Heaven in A FLARE OF TRUMPETS!!"

It seems tame when written, but if you could have seen that noble form, with its grand head, and rugged face, Gill the poet, utterly unconscious of the fashionable crowd moving past him, as with uplifted hands he pictured his idea of the Great Prophet's passing, you too would have been carried away to another world, and when you came down to criticism would have agreed that the music was not majestic enough to depict the whirlwind and chariot and steeds of fire.

Alas, we little thought, that night, that our friend was so soon to join the great choir above, but I shall never forget his looks; surely the "Spirit of God was upon him—the Spirit of wisdom and understanding, the Spirit of counsel and true godliness, the Spirit of knowledge and ghostly strength."

I suppose that Sir David's æsthetic fervour penetrated the spirits of his closest intimates. His notion about the passing of the prophet in a flare of trumpets came to some of us when *he* passed away, who regretted that to conclude the Memorial Service at St. Mary Abbot, Kensington, with the "Hallelujah Chorus," which always moved him so much, would hardly be consonant with the established practice of the Church. Mrs. Andrew writes in continuation—

I have just remembered another occasion when it was my privilege to meet him again "in tune with the infinite." Many years ago, when Ian McLaren's "Days

of Auld Lang Syne" was coming out in the *British Weekly*, we were at our cottage at Muizenberg in S. Africa. Sir David and Mr. Jacoby, the American astronomer, had come down for a breath of the sea, and we were all sitting on the verandah, when the train passed with Mrs. Waterston. She threw us a paper, and soon came along the road herself, with a request to Dr. Gill to read about Drumsheugh's fireside to us. It was the chapter where he and that other noble man, Dr. McClure, talk over their boyhood's days, how they guddled for trout, and about the people of the glen, and the experiences of life which made men and women of them. Then they began to count how many of them had already "passed to the other side," Burnbrae's "long journey," and the death of the little motherless girl. It was grand to hear our old friend roll it out in his sympathetic sonorous voice. We all listened in rapt attention, none of us Celts dry-eyed. When he got to the doctor taking the "bit lassiekie" on his knee and saying, "Ye're no feart dautie, ye'll sin be hame"; "Haud me ticht, Ducksie, and Mither 'll tak' me oot o' yer arms," he pitched the paper down, saying, with a sob, "I can nae mair."

Some of the accounts given of Gill's passionate appreciation of good music, though he was not a musician, recall Sir Charles Stanford's words about Tennyson—

Without being a musician, he had a great appreciation of the fitness of music to its subjects, and was an unfailing judge of musical declamation. As he expressed it himself, he disliked music which went up when it ought to go down, and went down when it ought to go up.¹

The subject of sacred music leads by a natural transition to that of Religion. Just as we saw his love for music cropping out in the Clerkenwell days as related by Mr. Haswell (p. 21), so also his simple, unquestioning faith was illustrated to the playfellow of his boyhood (p. 9), and to his mother on her deathbed (p. 6). In all these spiritual matters, and in all these ideals, cravings,

¹ *Studies and Memories*, by C. V. Stanford. Constable, 1908.

motives of action, and joyousness, the soul of David Gill seems to have remained unchanged from the age of ten to seventy.

It must be told, however, that all through his life there was an inherent reserve about higher things, which was never broken even to his intimates by any unsought-for confidences about his private thoughts and belief. And it is a most remarkable fact that, such being the case, and in spite of it, he was always perfectly ready and willing to answer a direct question upon these subjects, as upon any other about which his opinion was sincerely asked. He would even answer the questions by a reporter without any objection to their publication. When seriously consulted by a friend in trouble, he would open his heart to him.

A curious consequence of this reserve was that few of his subordinates had any knowledge of his profound piety. One of these (on the strength, as he said, of his peculiarly intimate relations with his chief) furnished the biographer with what he considered to be an estimate of Sir David Gill seen from the inside. Therein, to the astonishment of the reader, was the statement: "My own impression is that he was an Agnostic" [!] Such absolute, incredible ignorance was due simply to the fact that Gill never did thrust forward his opinions if they were not asked for.

One of the very rare occasions of departure from this habit of constraint and reserve is mentioned in a letter to Lady Gill written from the Mount Nelson Hotel, Cape Town, by Miss Leonard, on February 6, 1914.

The first time I met him [Sir David] was at the Mount Nelson. A man began to make cynical remarks about marriage and love—a middle-aged man with a wife and family. There were several quite young people present, and Sir David stood it for a while, with his brows knitted. Then he said, "Man, have you got a wife?" "Yes," said the man. "Then you ought to be ashamed of

yourself talking like that." There was a surprised silence, and then the subject was changed. But I never forgot. It is so rarely that older people have courage enough to say things like that, and it helps young people so much when they have.

Gill gave great respect to the man who followed science in any form, but he had little tolerance for the bad logic of those who take up the less exact sciences and who think that physiology supplies the data for deciding religious questions. His faith was as simple and thorough as that of Sir Isaac Newton or of the great leaders of exact science and mathematically accurate reasoning who were his friends. In common with practically all men who are leaders in any of the exact sciences, he accepted Professor Tait's repudiation of these pseudo-scientists.¹ He knew that Sir George Stokes' absolute belief in divine revelation² was invincible, that Lord Kelvin's definite pronouncements against the conclusions of materialists were logically unassailable,³ and that Clerk Maxwell's lifelong piety and his deathbed utterance⁴ were the beliefs of perhaps the most accurate and penetrating seer of the century.

The Bishop of St. John's, Umtata, Africa, in writing to the Dowager Lady Loch on February 2, 1914, about Sir David Gill's death, says—

And there were some things which one is especially glad to remember at this time—his perfectly simple faith in the love of God and our Lord's redemption. His faith was steady with the steadiness of real simplicity. I remember once meeting at lunch at the Observatory a German savant who was staying there. The talk after lunch turned on scientific subjects—general science, I think—

¹ Knott's *Life of Professor Tait*, p. 295.

² *Memoir of Sir George Stokes*, by Sir Joseph Larmor. Cambridge, 1907, Sec. I.

³ *Life of Lord Kelvin*, by S. P. Thompson, London. 1910. vol. ii. pp. 1091-4.

⁴ *The Life of James Clerk Maxwell*, by Lewis Campbell and William Garnett. London, 1882, *passim*, and p. 426.

and Sir David said something which implied—rather remotely—his own Christianity. “Do you believe in that?” asked the guest, almost startled. “I do,” was the answer, with a singularly impressive simplicity, which no doubt gave more occasion for thought and reflection than a long argument.

At a memorial service for Sir David Gill held at St. Michael’s Church, Observatory, Cape Town, the Rev. G. F. Gresley said that he might be allowed to say something about matters which were very little known.

I may say that we owe the existence of this church to his courage, his advice, his help, and his liberality. He was always a regular and devout attendant at Sunday morning service, and knelt at that altar month by month to receive the Sacrament.

All his friends were impressed by the solemnity with which he invariably said Grace before meals. The one witness who can testify on the matter says that during the whole of his life every day, morning and evening, he said his prayers. And, besides this private devotion, he had family prayers whenever he was not prevented by astronomical duties. A busy astronomer is, of course, unable, while on duty, to meet the family and domestics in this way. Their meetings, in fact, were very different; for it often happened that the Dutch cook, meeting her master at sunrise, would say, “Good morning, sir,” to which he, on his way to bed, would respond, “Good night, cook.”

A dear friend, writing to him in great trouble, received the following reply—

I have the very deepest sympathy with what you tell me of your inner life—and am thankful that you have found the only solace and guide in all such troubles. We, however, never can have by instinct or by any other way a knowledge of God’s purposes towards us—we can only try to do what we believe He would wish us to do.

In our affections and the closest and dearest relations of life, instinct, if not rendered unreliable by passion or self-interest, is generally a good guide. . . . The simplest rule in all life is to ask one's self what Christ w^d have done in the circumstances, and then try to do what you honestly believe He would have done. None of us can always do that—but the better we try the better we shall bear and the better we shall be.

Often the things that seem to be the greatest trials in life turn out in the end to be the greatest blessings. You cannot grow a hardy flower in a hothouse—it is the trials of life that make the moral training, just as it is the poor soil, the winter blast, the unwilling harvest, that make the hardy Scot about whom we said not a little on Saturday night at St. Andrew's dinner.

It has been said that Sir David Gill had no objection to answer any questions asked even by an interviewer. The editor of *Great Thoughts*, however, makes the remark—

From the interviewer's point of view, Sir David possesses only one fault—he has an invincible objection to talking about himself and his achievements.

Yet this interviewer, by direct question, was able to get this very definite statement from him—

There is no subject which appeals, or ought to appeal, more strongly to the imagination than that of astronomy, nothing which lifts men, or ought to lift them, to a higher plane of thought, or gives them a better grasp of the infinite power of the Creator; nothing that exemplifies more completely the unity of design that exists in Nature; nothing that teaches more the Christian lesson of humility, and yet, at the same time, affords the highest proof of the intellectual possibilities open to man.

It may be all the more worth while drawing attention to this side of the personality of this great astronomer at the present time, when the whole civilized world is now fighting for the laws of God against the rules of right

and wrong devised by an arrogant, brutal and impious race.

It will surprise many to find that a man so reticent as David Gill was quite willing to answer directly any question about his faith.

TO A. H. TABRUN, Esq.

34 DE VERE GARDENS, KENSINGTON, LONDON, W.,
October 16, 1908.

DEAR SIR,—In reply to your letter of the 15th Inst. You need pay no attention to the anti-religious lecturer you wrote of—or his assertion that “scientific research has shown the Bible and Religion to be untrue.”

The assertion is unfounded rubbish. Look at the frequent statements to the contrary of our most eminent men, such as the late Lord Kelvin and Sir George Gabriel Stokes.¹

People too often try to make cheap capital out of poetic similes in the Bible—just as if the Bible was a scientific treatise—which it is not.—Yours faithfully,
DAVID GILL.

TO A. H. TABRUN, Esq.

DEAR SIR,—I have no objection to your publishing the letter as enclosed. [The one reproduced above.]—Yours faithfully,
DAVID GILL.

Again, in 1909, he was asked by Mr. W. H. Howard Nash to answer the following questions, and he made no difficulty.

1. Is it your belief that the Universe had an Intelligent First Cause?—Ans. : “Yes.”
2. Do you attribute Personality to that First Cause?

¹ The reader may be interested to compare Sir George Stokes' reply to the same, or a similar, letter from Mr. Tabrun. It is in the same sense as Sir David Gill's but fuller; and is followed by explanatory letters extending over nearly six years, occupying fifteen pages (vol. ii. pp. 76-90) of his *Memoir and Scientific Correspondence*, Cambridge, 1907, selected and arranged by Sir Joseph Larmor, Sec. R.S., etc.

3. Do you believe that Man has the faculty of apprehending God?

[Opposite these two questions Gill wrote:] "Canst thou by searching find out God, canst thou find out the Almighty to perfection?"—and added the remark: "I do not think that your questions 2 and 3 are capable of a more definite answer than that which I have given you in the words of Job. What is personality? What is apprehending?"

4. Is it your belief that man's personality survives in a conscious state beyond the grave?—Ans. : "Yes."

5. Do you believe that God has revealed Himself to Man pre-eminently through Jesus Christ?—Ans. : "Yes."

6. Do you believe Jesus Christ to be "The Son of God"?—Ans. : "Yes, in the sense that *He* said so."

7. Is it your belief that Man possesses "free will" within limits?—Ans. : "Yes."

8. Is it your belief that the Bible contains a Divine Revelation?—Ans. : "Yes."

Lastly: May we, if necessary, use your name in connection with your replies?—Ans. : "Yes."

(Signed) DAVID GILL.

CHAPTER XXIV

THE PERSONAL SIDE OF DAVID GILL (*continued*)

Gilliana—Humour—Friendship

THE musical taste and religious faith of David Gill were a part of his personality, of the Spirit which was the source of his intellectual and physical acts. And to them were added a genial love for all true people, for all noble effort, a deep sympathy with those in trouble, and a bright outlook upon the world and its enjoyment.

Naturally, such a man quickly detected the humorous side of any occurrence, enjoyed a witty story, and himself possessed a store of them. When resident in London, after his retirement, he dined out a great deal, and was regarded as the best of company and a delightful raconteur. At public dinners, too, he was generally ready to relieve the tedium of prosy speeches by relating some amusing anecdote.

There may have been an occasional slowness to catch the point of a joke, and some of his best stories may have been worn rather threadbare. The oft-told story of a threepenny bit at a distance of a hundred miles is one in point, but it was not himself who wore it threadbare. It was the newspaper reporters who got hold of it, and used it to show his appreciation of a joke even against himself.

It might be truly said that, in all his greatest practical work of observing, Gill spent his whole life in the hunt after one-hundredth of a second of arc, and that he was the first astronomer who caught it. It was to a great extent owing to this that we are now able to say that the

records left by Sir David Gill are probably unsurpassed in value by those of any living astronomer who has worked upon similar lines.

In the year 1872, while the writer was studying practical astronomy at Greenwich Observatory under Airy, he mentioned to Gill a quaint dictum of Airy's (which fairly represented the degree of accuracy then sought for by astronomers), that "a tenth of a second of arc is the smallest thing in the world." In 1876, at Dun Echt, Gill showed him his heliometer observations at Mauritius, sheets upon sheets of concordant results, and then asked: "Will Airy deny now that there is such a thing as a hundredth of a second of arc?" When visiting England in 1884, after showing his work upon stellar parallax at the Cape, he repeated the same question. At later dates, when the writer visited him at the Cape, bundles of MS. were produced to show the results obtained with his new heliometer, and again the same question was repeated in the same words.

That any one should have made a jest of a life's quest might hurt some people, but no one enjoyed the following joke more than Sir David.

The small angle referred to ($0''.01$) is less than that covered by a threepenny bit at a distance of a hundred miles. Gill expressed it so in a lecture on the most refined measurements attained by astronomers, to the Institute of Marine Engineers, of which he was the president, two years before his death. Afterwards he thoroughly enjoyed narrating how the chairman, at a dinner in the evening, when proposing the lecturer's health, said there could be no doubt about his nationality, because nobody but a Scotsman would bother about a threepenny bit a hundred miles away.

Part of the humour of this sally arose from the fact that Sir David's broad Aberdonian Doric, and rolling r's, proclaimed his nationality to any one who ever heard him speak.

When lecturing on the Fixed Stars Sir David wanted an illustration of the distance to the nearest star, *α Centauri*. This is what he said—

We are a commercial people; we like to make out estimates in pounds sterling. We shall suppose that some wealthy directors have failed in getting Parliamentary sanction to cut a sub-Atlantic tunnel to America, and so, for want of some other outlet for their energy and capital, they construct a railway to *α Centauri*. We shall neglect for the present the engineering difficulties—a mere detail—and suppose them overcome, and the railway opened for traffic.

We shall go further and suppose that the directors have found the construction of such a railway to have been peculiarly easy, and that the proprietors of interstellar space had not been exorbitant in their terms for right of way. Therefore, with a view to encourage traffic, the directors have made the fares exceedingly moderate—viz. first-class at one penny per 100 miles.

Desiring to take advantage of these facilities, an American gentleman, by way of providing himself with small change for the journey, buys up the National Debt of Great Britain, and of a few other countries, and, presenting himself at the booking-office, demands a first-class single to *α Centauri*. For this he tenders in payment the scrip of the National Debt of Great Britain which just covers the cost of the ticket; but I should explain that at this time the National Debt, from little wars, coupled with some unremunerative Government investments in landed property, had run up from 700 millions to 1,100 millions sterling. Having taken his seat, it occurs to him to ask—

“At what rate do you travel?”

“Sixty miles an hour, sir, including stoppages,” is the answer.

“And when shall we reach *α Centauri*?”

“In 48,663,060 years, sir.”

“Humph! rather a long journey.”

When called upon as an astronomer to make an after-dinner speech to a mixed audience he often gave them

an astronomical anecdote. On one occasion he gave the following—

A meteorite fell in a field on a Scottish farm. The landlord claimed it under a lease which entitled him to all minerals and metals on the land. The tenant, however, claimed that it belonged to him because it was not on the land when the lease was drawn. Equal to the occasion, the landlord claimed it as "flying game." "But it has neither wings nor feathers," rejoined the tenant; "therefore, as ground game it is mine." At this point the discussion was cut short by the appearance of a Revenue Officer, who took possession of the meteorite as "an article introduced into the country without payment of duty."

He was tremendously tickled by the story of Lord Tullibardine and the sucking pigs that was going round London a few years ago. The next time he was at Blair Castle he asked if it was true. The Marquess replied: "I never heard it before, and there's not a word of truth in it, but it's a d——d good story."

He was in the way of picking up good stories by the score, but was revolted by the questionable ones which by some were supposed to be witty. If he were writing a letter to an intimate friend it was quite a common thing for him to introduce the last good thing he had heard, that his correspondent might share the fun. Earl Grey and he used to have regular sets to in South Africa, capping each other's tales. When Lord Grey went to Canada as Governor General they still swopped yarns by letter.

Writing home to a great friend at that time he inserts, *à propos de bottes*, a story extracted from the following letter.

FROM EARL GREY

GOVERNMENT HOUSE, OTTAWA, *February 14, 1905.*

MY DEAR ASTRONOMER,—A thousand thanks for so kindly writing to me from Johannesburg to tell me about my boy. He writes me excellent letters which lead me to believe he is both interested and happy. I hope he is

liked by his Chief and appreciated by those with whom he comes in contact. You will like him when you get to know him.

Here is a story which will amuse you.—A Custom House officer put the usual question to an American lady the other day on arrival at New York, as to whether she had any dutiable goods. "No, nothing but wearing apparel," she persisted, and showed some indignation when the Custom House officer, distrusting her word, proceeded to open her box and rummage right to the very bottom. With triumph he pulled out from below her dresses two big magnums of whisky, and holding them by the neck asked the lady what she meant by saying that she had nothing in her box but wearing apparel. "I stated what was the truth," said the lady, "for you hold in your hand my husband's night-caps!" The official immediately withdrew his claims, and the lady withdrew in triumph.

Can you send me back a better one which I can tell Sir Wilfred Laurier, whose story this is?

I am much distressed that you are not able to give me a better account of your delightful wife. Please give her every assurance of my continued devotion.

I am sorry you saw so little of Halifax. He has been terribly upset by the death of his favourite sister.

When you have time please dash me off a line, for I enjoy keeping myself in touch, as far as possible, with South Africa. I remain, yours ever, GREY.

FROM EARL GREY

GOVERNMENT HOUSE, OTTAWA, *July 9, 1906.*

MY DEAR ASTRONOMER,—When are you coming to pay me a visit in Canada? It is a long time since I saw your handwriting, or had a laugh over one of your stories. On this side of the Atlantic old chestnuts are much appreciated, so when you come bring as many as you can collect.

Please give my devoted regards to Lady Gill, and if she comes with you so much the better.

I remain, yours ever, GREY.

FROM EARL GREY

DORCHESTER HOUSE, PARK LANE, *March 23, 1895.*

MY DEAR GRINDSTONE,—Forgive me. I admit I ought to have my nose pressed well upon it as a reward

for my acknowledg^{ts} of astronomical observations from Cape Town, and now I only write, such is the way of mankind, to ask *a favour* from you and dear Mrs. Gill, if I may venture to call her so ! and that is if Lady Helen Vincent (sister of the beautiful Duchess of Leinster who is just dead) is still in Cape Town—she sailed in the *Scot* last Saturday—will you make a point of finding her out and being nice to her ? When I tell you she is a beautiful woman and has a mind and character as beautiful as her face and has many tastes in common with Mrs. Gill, I think you'll just shut up your old telescope and bring upon her the battery of a human eyesight unaided by any lenses. But I expect you have already made friends, for I told Sir Edgar Vincent all sorts of nice things about you and Mrs. Gill and that he was to make a point of making y^r acquaintance before he leaves Cape Town.

Met Herschell and his wife the other day. We all cracked you and Mrs. Gill sky high, out of reach even of your telescopic photographer.

No time for more this mail, but must beg you to thank Mrs. Gill from me for her dear letter. It was very kind and nice of her to write. I have never thanked you, have I, for your Grindstone. I enjoyed it, particularly its national modesty, and passed it on to another scoffing but appreciative Southerner.—It is, I believe, getting quite well-thumbed.—Believe me, with friendly greetings to dear Mrs. Gill, Yrs most truly,
GREY.

FROM EARL GREY

GOVERNMENT HOUSE, OTTAWA, *February 6, 1905.*

MY DEAR ASTRONOMER,—If you can read any good stories out of the heavens thro' your telescope, please pass them on to me—I send you 2 silly stories just for you to cap.

Getting on all right here. Everybody anxious to help with both hands.

Hanbury Williams, your Nominee, 1st rate, wife ditto. No trouble too great and lots of tact. Come and pay me a visit and bring the Divinity with you and in her red gown.

Just in from 2 hours on snow-shoes, and every inch of my body *red-hot*, altho' the Thermo. says it's zero.

My DEVOTED regards to Lady Gill. Yours ever,

GREY.

Any joke with a university flavour was as acceptable to him as an astronomical one. Here is one that he used to tell.

An English tourist just arrived in Edinburgh was asked by a ragged urchin for a bawbee. "Do you do anything for a living?" he asked. "I beg," was the reply. "What does your father do?" "He begs." "And your mother?" "She begs." "Have you any brothers or sisters?" "I've one brother, and he's in the university."

The Englishman had often heard of the straits undergone by many a poor Scottish family, that they might be enabled to send one of their number to college, and was delighted to have come across so striking a case of the father and mother and one of their sons, in poverty, and begging in the streets that the other might be educated and, perhaps, enter the "meenistry."

So he put a further question about the brother, to which the reply came, "He was born wi' twa heids, an' they keep him in a bottle."

Although modest and humble in his dealings with all men, Gill was never shy nor flustered in the presence of the most distinguished or exalted personages. If put in an awkward position by any circumstance he could save the situation with a *bon mot*. One evening after his retirement he was a guest at a reception in a certain lady's London house. He and a most distinguished ecclesiastic were in close juxtaposition when their hostess advanced and addressed them in these words: "I want to make the greatest astronomer in the world and the greatest preacher in the world acquainted," and after introducing them, moved off. There was dead silence between the two men for some seconds. Then Gill looked his companion in the eyes, and said with his humorous twinkle: "It is not often that either of us meets such a distinguished man." This broke the ice.

There was certainly a wonderful charm about the man and his conversation, as all who knew him, however slightly, testify. Physically, the ready twinkle of his

eye, the pleasant smile, occasionally only on one side of the mouth, and the striking and self-reliant, yet enquiring voice, all played their part.

Gill's detestation of anything but the best in astronomical work of precision sometimes raised a laugh from the forcible language in which he expressed it. On one occasion he writes to the secretary of a society—

I am returning the paper to Wesley. The paper justifies Mr. Hough's definition of its author, namely, "the Apostle of the Slap-dash." The outstanding errors were from $-4''$ to $+7''$ —!!!!

On another occasion, at a Council meeting, a certain astronomer whose paper was under consideration wrote to withdraw it "on account of the pressure which had been put upon him by Sir David Gill." Whereupon Gill burst out: "I never put any pressure upon the man at all. I only wrote blaw . . ." and the rest of the sentence was lost in general laughter.

Gill could not understand how any man could be an astronomer for the sake of his salary and not for love of his science. Occasionally he had a revelation. An incident connected with one of these men sent him into fits of laughter whenever he told this story, which Mr. Trimen wrote down when it was told to him—

One day in Germany Gill was saying good-bye to an astronomer with whom he had been settling plans of observing, when the latter begged a few moments of confidential talk.—"My dear friend," said he, "tell me, you think, do you not?—that I am good astronom?"—"That requires no argument," replied Gill, "it is a patent fact."—"Ach, so! I am glad to hear your so high estimate. But, my friend, that is only my *business*;—I do it to my utmost, always; but meine Seele—what you call the heart—nicht so?—is mit *Peetles*!"—"With what?" rejoined Gill in astonishment. The seer then rose, and ushered his guest into a smaller room, the walls of which were almost wholly occupied with shelves of neatly arranged boxes resembling books.—"This," he

said, "is my collection of *Peetles*—Insecta Coleoptera—which, indeed, I most of all love ! "

Gill, suddenly enlightened, could only observe, " Oh, *Beetles* !—Yes, I see ; you *have* surprised me ! " — " Scarcely one do I tell of this, my cherished pursuit," declared the Astronom ; " but I venture to ask you, my dear friend, for a very great favour. You now return to the Cape—is it not so ? My collection is most wanting in the *Peetles* of that land, and I pray you to send me some that live there."

Mr. Trimen goes on to tell us—

To suffer fools gladly (more or less) is the lot of the head of almost every scientific institution in regard to the ordinary run of visitors ; and Gill's courtesy and patience in this respect, under whatever provocation, were unfailing. But while thus considerate of the frankly unlearned, he could ill tolerate pretence or affectation of knowledge, and he had an admirable faculty of absolutely ignoring any attempted display of the kind.

He had a still keener detestation of anything mean, underhand, or disloyal, and on occasion did not hesitate promptly to express his strong condemnation. This was conspicuously shown in the troubled times preceding the Boer War, when he publicly as well as privately denounced the treachery of those—including some of his own personal acquaintances—who were surreptitiously backing the machinations against England of the notorious Afrikander Bond.

When asked at the Cape why he hated showing inquisitive ladies or tourists round the Observatory, and if it bored him, he said, " It's not *bored*. I don't mind that, but how would you feel if you saw them desecrating a church and profaning the altar ? "

He was asked how it came that, while he liked to hear people talk of his skill in shooting, he resented the customary praise of his astronomical work. He replied,—As to shooting, I know I am, or was, a good shot. When we shot in competitions I was glad to win, and it pleases my pride to hear people remind me of it. But in astronomy

if people praise my work they don't know what they are talking about. The whole subject is so vast and overwhelming that I feel "ashamed and humbled" when I think how little I, or any one like me, can do.

Astronomy was to him a sacred subject. He could not bear to hear it spoken of as anything less by the ignorant would-be learned. But any one who really sought for information, however ignorant, was met halfway.

Mr. Lecson writes from the Athenæum—

One day asking him about the double Vega [Sirius?] I said: "Mind you, of course, I am only an amateur"; he replied—slapping his knee—"Why, bless my soul, that's exactly what I am."

Another day, asking him whether he considered our stellar system was a system in itself, and so, limited, he replied—"My idea is that if you could get up to the Nebula in Andromeda you would see our system and the Milky Way as a small cluster of faint stars."

The breezy atmosphere that Gill carried about with him, and spread through any sympathetic coterie in whose presence he might be, is remembered by the wide circle of friends, astronomical and otherwise, in whose society he spent so much of his time after his retirement while he and his wife occupied their charming bright flat in Kensington.

Mr. Trimen tells what a distinguished official at the Admiralty once said to him.

It is always a great treat to his friends here when Gill looks us up; it is like a refreshing breeze that clears away dull cobwebs of the London gloom, and the frigid coils of red-tape routine seem to relax and shrivel up before his genial sincerity and good fellowship.

Sir Joseph Larmor, writing from Cambridge, says—

I well remember a meeting of the Astronomical Club here at which I was invited to meet him, when the vigour

and insistence of his onslaught on the problems of discrepancies between aberration and solar parallax acted as a refreshing storm does on a stagnant atmosphere.

In the same way Gill's dominant personality at scientific conferences in Paris has been recorded by some who were present.

Mr. Knobel relates the following anecdote—

During the Paris Congress of 1887 Gill and some other astronomers called upon Dr. Lohse of the Potsdam Observatory, who spoke English very well. Gill at once began a long explanation to Lohse of the aims and objects of the Congress, in which he touched upon several matters, all in his vigorous Aberdonian. At the conclusion he said, "I hope you have quite understood me?" Lohse replied, "Not a word." (Roars of laughter.)

The following is told by Mr. A. Hinks about Gill.

It was an unending pleasure to watch him at the Paris Conferences; his extraordinary flow of very Aberdonian French and the courage with which he would tell humorous stories and wonder what had become of the point in the translation, and the ease with which he converted any evening function into a dance, and the extraordinary respect in which he was held by the scholastic kind of astronomer who had no idea beyond the text-books, were all quite delightful to see.

* * * * *

Of course the first thing that struck one was his single-hearted enthusiasm. I have never known any one else so absolutely keen, and so fully convinced that whatever he took up was worth doing with all his might. He showed this in everything. And, of course, it naturally followed that he had some difficulty in understanding how anybody else could think differently or that anybody else was thinking about anything else except the subject which occupied his mind. This was sometimes amusingly illustrated in such cases as an astrographic conference. I have seen him come into the middle of a discussion, and without waiting to gather in the slightest degree what was under way, he would burst in with a vehement harangue on what he imagined ought to have been under

way. "It is Jupiter tonans," remarked Backlund one day when he had been presiding.

So at the Cape meeting of the B.A., when Kapteyn was reading his great paper on star-streams, Gill broke in every half minute with a question or an argument, so that at the end of Kapteyn's paper Forsyth very adroitly called upon Gill to "continue the discussion."

But his intense interest in hearing the reading of a really great scientific paper, announcing results achieved by patience, the work of a genius, generally overwhelmed him with the silence of that deep humility which was always part of his nature.

Mr. Flinders Petrie recalls a remarkable scene to memory, perhaps the most delightfully characteristic of all the Gilliana which are current among his intimates.

At a Royal Society meeting Dr. G. E. Hale (U.S.A.) was describing his marvellous solar photographs in a single spectral ray. At the end of the address the President asked Sir David if he would say something. He rose slowly to his full height, said—"Wor-r-shipful admir-r-ation"—and sat down again.

The same friend and admirer of Sir David's, who had helped in reducing his Egyptian Pyramid triangulation in 1879 tells of another incident—

When Gill was President of the British Association [1907] I happened to join a carriage with him and others. He did not notice some one saluting him in the street, and one of his friends said to him that he must remember he was President and be on his dignity. He replied, "That is just what my brother said to me—'Davie,' said he, 'you've no more dignity than a duck.'"

When Gill had completed the Cape Observatory, equipped with instruments in many ways surpassing those in any other observatory, with something of Airy's discipline at Greenwich, and something of Otto Struve's patriarchal astronomical colony at Pulkowa, he had piled up such a mass of definite results of

patient labour as would have filled with pride any one with less exacting standards than his own. His retirement to England did not interrupt his astronomical activities. And it gave him the unalloyed happiness, from which his twenty-seven years of exile had debarred him, of being in the centre of intellectual, artistic, and social activities. He derived uninterrupted pleasure from the easy intercourse with old friends, and the opportunities of making new ones. And this pleasure was reciprocated. Astronomers, too, from all parts of the world were often for the first time able to feel that friendly handshake of his and learn his appreciation of their own work.

Among these, Dr. G. E. Hale, the able Director of the Mount Wilson Solar Observatory in California, who became one of his continuous correspondents, has been kind enough to write his impressions of the beginning of their friendship.

I shall never forget my first encounter with Sir David Gill. The library of the Royal Astronomical Society was crowded prior to meeting, and tea was in progress. Some one said that Sir David wished to meet me and led me towards him. I must confess that while I went with pleasant anticipation, there lay beneath it a slight measure of doubt. Gill in his post of vantage at the Cape, had always impressed me as a strong and vigorous leader, whose preoccupation with research and organization in the field of the older astronomy would leave little room for sympathy with so unorthodox a worker as myself. It is true that his visit to Potsdam and his enthusiasm for the pioneer labors of Vogel in the photography of stellar spectra, had modified my impression in some degree, especially after the radial velocity campaign had been inaugurated with his customary vigor at the Cape. But the old doubts still lingered in my memory when I met him face to face.

The cordial hand-grasp and the smile which is still before me swept all such vapors away. Certainly no space was left for other thoughts when he asked, with little preliminary: "What are you going to do with that

five-foot reflector? " I attempted to sketch the observational programme we had been formulating. But before I could finish he burst out, " All wrong! You should do nothing but radial velocity work! " I had scarcely begun a defense of my views when the meeting was announced, and we were separated until later in the evening.

We dined at the Criterion with the Astronomical Society Club, where I heard again with pleasure the informal talk, full of quiet humour, which contrasts so agreeably with our set after-dinner speeches. Hardly were the toasts concluded when Gill brought his chair over to mine, and remarked, " Now go ahead and defend yourself. " The twinkle in his eye overcame any possible fear of aggressive intent, and the cordial interest he showed in my plans, which he soon admitted might be worthy of a trial, was characteristic of the man. Time has shown how much reason lay in his claims for the importance of radial velocity measures. Formerly they entered only incidentally into my scheme, which was to bear directly on the physical problems of stellar development. At present, when half of the time of the 60-inch is devoted to radial velocity work, which will play a similar part in the programme of the 100-inch reflector, I could hardly argue with conviction against the views he then expressed.

Thus began a friendship which, I am proud to say, lasted through his life.

Dr. Hale goes on to tell of the very great help that was given to him by Gill in designing the details, both optical and mechanical, of the great 100-inch reflector now being installed at Mount Wilson.

The personal friendship thus brought by Gill into his professional relations with astronomers from abroad is referred to by many correspondents. The Imperial Russian astronomer, Dr. Backlund, says—

Generally speaking, Gill's character was such that when he took scientific interest in a person he intermingled also personal friendship. Gill was an uncommonly harmonic man, in him the highest scientific qualities

were joined with moral purity. He was one of the tenderest of husbands I ever met ; owing to failing health Lady Gill was seldom able to accompany her husband to Congresses ; he then wrote or wired daily to her—to use his own words—“ to my darling.”

At the farewell banquet in Cape Town to Sir David Gill, the Hon. E. H. Walton, while proposing his health, used these words—

We shall miss him and his breezy pleasant presence ; we shall miss his resonant voice ; we shall miss his transparent sincerity—his honest hatred of cant and sham and humbug. We shall miss his great heart, and his ever-ready sympathy. We shall miss him as a friend, and as a citizen who has ever been prepared to take on his broad shoulders his full share of the duties of citizenship.

Referring to this speech, the local paper said—

And if the Astronomer Royal will be missed, the gracious lady who has been his helpmeet throughout the long period of his service in the Colony, will also leave a blank that will be felt in the social life of the community. Lady Gill may well be regarded as one of the best and sincerest friends the Colony has ever possessed. . . . The progress of the Observatory-road Church, the establishment of nursing centres for those whose means did not allow of this necessary aid at their own cost, the foundation at the Cape University of a Victoria Scholarship for Colonial girl students, the extension of the Women's Diocesan Association—of which she has been the beloved president since its inauguration by Lady Loch in 1890—all these, and several other beneficent works owe nearly all they possess of prosperity to her clear intellect, her never-failing enthusiasm, and, above all, her unflinching tact and unsparing personal attention to detail. . . .

It is difficult, too, to depict from the outside the feelings Lady Gill excited by years of loving interest in all that affected the happiness of those who lived within her own immediate circle at the Observatory.

CHAPTER XXV

THE PERSONAL SIDE OF DAVID GILL (*continued*)

The love of sport—His first great deer-stalk.

No friend of Gill's ever claimed that he was a great theorist. He had none of the speculative power of a Clerk Maxwell, Faraday or Kelvin; none of the mathematical depth of insight possessed by Stokes or Rayleigh. His intellectual power and his upbringing had more in common with Stephenson or Brunel or James Watt; or, in his own special department of science, with Tycho Brahe, Bradley or, perhaps, most of all, W. Struve.

We often notice that many a man, while striving for a position in science, may keep in the background his tastes in other directions. Gill could not pose. He never desired to appear, to himself or to others, in private or in public, in youth or old age, anything but exactly what he was. The most stern and unbending of astronomers, or the most bigoted intellectual, had to accept him not merely as an astronomer, but also as a gregarious being, fond of society, of music and dancing, of humour, of beauty in nature and art, of golf, or of sport with gun or rifle.

To understand the man in his entirety this last point must now be accentuated. There is no doubt his early skill and precision of hand and eye, with the match rifle, was allied to his remarkable powers of accurate observation of the stars.

His care to make every single shot with the rifle tell upon his scoring card to eclipse the scores of his com-

petitors was exactly the same as his care to make every single observation with the heliometer tell upon his resulting probable error, to eclipse the probable error of his fellow-observers.

The wholesome glow of vitality which the true sportsman feels in a successful stalk, in following a well-trained pointer, or in facing the whirr of driven grouse at the butts, is not easily acquired by one not bred to it, and this spirit was a part of David Gill. It found fuller freedom for its realisation after his retirement. But long before that his letters often show his desire to arrange an astronomical meeting so as not to interfere with a legitimate opportunity for a day on the moors.

One of the most vivid impressions of the non-astronomical side of Sir David Gill is contained in a long letter to his brother Jem in Australia, in 1901, after one of his home visits. If any astronomer grudges this space which might have been given to science, he may be surprised to know that the greater number of Gill's friends were not astronomical; and these friends on their side may justly say that, if this book aims at giving memories of the man himself, far too much space has been devoted to astronomy.

This letter (most fortunately preserved with many others by James Gill) is a sample, and the best possible sample, of his enjoyment of life, and of the happiness he derived from his very wide circle of dear friends, and is particularly valuable as giving his experiences the first time he ever went deer-stalking in the highlands.

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1901, *February 23.*

MY DEAR JEM,—I have been an abominably bad correspondent, but when I came back here in Nov. I found myself so overwhelmed with accumulated arrears of work that I put off all private correspondence for that more convenient season which is always so long a-coming.

Y^r letter telling me that you had remitted £125 each

to the boys and myself from proceeds of Xmas Creek is confirmed by the arrival of a letter from Harvey Hall—and he has doubtless duly sent official receipts.

* * * * *

I've had an awfully good time at home.

We sailed on the 8th April [1900] in one of the intermediate steamers and touched at St. Helena, Ascension, Teneriffe and Madeira. Bella was a good sailor for her, and arrived in England much better than she left the Cape—except that a growth under her big toe had developed during the voyage, giving her great pain, and it had to be cut out under chloroform the day after we arrived.

Our friend McClean (the donor of the new telescope here) was waiting at the platform, and we drove to his house—11 Onslow Gardens—and stayed with him and his family the first three weeks. A few days before the Queen's birthday I got an invitation to dine with the First Lord of the Admiralty, and fancied from that there must be some honour in store. The day before the birthday I had an interview with Mr. Chamberlain about the political situation, etc.—he having sent for me—and at the end of it he said, "I hoped to congratulate you to-morrow, but Mr. Goschen has asked you to his dinner." When I got back to Onslow Gardens I found Bella and Mrs. McClean in great excitement—a messenger having arrived from the Foreign Office with a letter from Lord Salisbury addressed to me, and which of course they had opened to find an announcement that the Queen had been pleased "in consideration of your distinguished position in Astronomy" to create you a Knight Commander of the Bath—and conveying Lord Salisbury's personal congratulations.

We had a very delightful visit to the McCleans—its only drawback being that Bella was unable to go about for the first fortnight till the toe healed. Then we went into rooms in Emperor's Gate—where we were most comfortable, the Landlord being a retired Butler and his wife a retired Cook—and both excellent.

The Athenæum had elected me, under Rule II, a very exceptional distinction when one is not resident in England. They used to make me an Hon^y Member during my visits to England, but so far as I know the only members elected under Rule II who are not resident in

England are Sir Alfred Milner, Mr. Cecil Rhodes, Sir Frank Lascelles (British Ambassador in Berlin) and myself. Under Rule II nine members are elected annually, but the "Club intrusts this privilege to the Committee in the entire confidence that they will only elect persons who shall have attained to distinguished eminence in science, literature or the arts, or for public services."

Bella, after a little burst of dissipation, found that she had to limit her dissipations to two dinners a week—but I think during May and June I only dined or lunched three times at home (except when the McCleans had a party at home). Bella's foot began to bother her again, and this was a sad worry to her, especially when we went in the beginning of July to the McCleans' beautiful place near Tunbridge Wells. There I left her at the end of the first week of July, and went over for a week to Holland, to visit my friends Prof. Kapteyn of Groningen, and Bakhuyzen at Leiden—and I stopped for a day with Sir Henry Howard, our Ambassador at the Hague.

I picked Bella up at Tunbridge Wells, and we returned for a week to our old rooms at Emperor's Gate, went to Windsor and rec^d my K.C.B. at the hands of the dear old Queen, and I believe I am the last man who received that distinction at her hands.

A day or two after that I went over to Paris to attend the Astrographic Congress, and remained there some 10 days. Bella's foot was so troublesome that she could not go to Paris with me. Returning to London we went a few days afterwards to Harrogate, where I put Bella under the care of Dr. Frank Smith (a brother of Elmslie Smith of Aberdeen). He seemed a capable man—said the growth had not been properly excised and proceeded to burn out the rest of it with nitric acid. It was a horribly painful process—but by the end of a month the cure was complete, and she has had no more trouble.

I only remained in Harrogate till the 11th Aug^t and then went north to shoot Andrew's moor!

* * * * *

I saw my old friend Tom Duff of Drummur—but he had let his shooting.

I also spent a night with Andrew Baird—now a retired R.E. Colonel, who has built himself a very pretty house near Elgin, and then Andrew and I went to his friends

Baynes of Finlay where we had a little shoot—some 6 or 7 brace—the birds as wild as the wind.

I drove thence to Allargue, on Donside—where I had a couple of days with J. W. Barclay—42½ brace the first day, and 25 (a short day) the next. From there I drove across to Aboyne (stopping by the way to lunch with Sir John Clarke at Tillypronie), dined with Harvey Hall, went next day with him to Mrs. Pickering (Bella's cousin) at Kincardine O'Neil Castle, where I was strongly tempted to stay for salmon fishing—an afternoon party at Desswood, where I met all Deeside, and dinner with John White at Bridge of Don.

Then back to Harrogate. Bella had been well looked after at Harrogate by our quondam Cape Admiral—Sir Fred. Richards, and General and Mrs. Cox (formerly commanded the troops in Natal). A few days in Harrogate and then Bella and I went off to Tapton Hall, Chesterfield, where we spent a couple of days with the Markhams.—from there we drove to Peversal, where we stayed for three days with Lady Carnarvon, who is an old friend—widow of the late Lord Carnarvon; Bella then went up to London and I went to Wynyard Park to stay 3 or 4 days with the Londonderrys. We had Sir Wm. and Lady Harcourt there, the old Duchess of Cleveland (a wonderfully spry old lady considering she was one of the Queen's bridesmaids), Lord Shrewsbury (Lady Londonderry's brother), Canon Tristram of Durham, young Vernon Harcourt and his wife, and some others. Bella didn't feel able to go and had to excuse herself at the last moment.

Then up to London. I ought meanwhile to have told you that we brought a Miss Rankine with us from the Cape, who is a trained nurse—so that Bella was never left alone. After a week in London I ran back to Ross-shire, where I had long promised to go for some deer-stalking. There is a young fellow Cookson who is very fond of astronomy—who is completing his studies at Cambridge and is coming here to work at practical astronomy. His Father is a very rich man and has the forest of Braemore in Ross-shire. I never had a chance of Highland deer-stalking and was very keen for a shot. Before going out the first day I insisted on sighting the rifle, which had been fitted with an aperture back sight—and found it quite out—shooting about a foot too low at 130 yds.

I found the correct reading—viz. 300 yds. for 130, so that I felt I could hit anything.

To cut a long story short—After a lot of spying &c., we found that there was nothing but a long flank movement.

We were at the point O where we had been spying. There were several lots of deer on the opposite hill, but none heavy enough to shoot.



About 12 o'clock 4 deer—one of them a big one—apparently started from C having got our wind and got into the moss hag where they rolled—or rather the big stag did, for half an hour. Then he apparently forgot about us and went and laid down at A. "Now," said the stalker, "we've got to go back the way we came, go round by the loch, and climb over those hills by the back and come down on him." I have shown the line we walked till we came to D, then down we dropped flat in the heather, and we thought it was all up, for three deer who had been

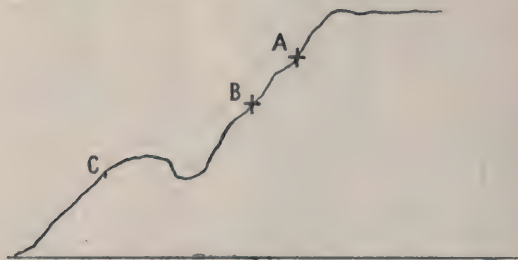
feeding at or near the point C, caught sight of us—and away they went as hard as they could go along the dotted line from C, and our friend at A got up to look, and seemed on the point of going off too. But we had been too quick for him, and after looking for half an hour he lay down again and the others at A began to feed. Then keeping as flat as we could we crept on hands and knees or on belly over any open ground along the dotted black line [the line DB]—till we were well round the corner of the hill. Then we climbed up—800 feet—to the top and then slithered down a burn flat on our backs—then crept out of the burn on our bellies behind some low rocks—and then the old stalker said, “Now if you look round that rock you’ll see y^r stag. He’s only 60 yards off, behind a rock, you can just see a bit of his back and his horns, and you must wait till he gets up before you shoot.”

When I looked there he was—



I put the bead on him, crept back to the stalker and said, “Bosh, man, I’ll hit any square inch of him——.” “Na, na, ye manna shoot—I’d no kill him mysel.” “But,” I said, “it’s quite easy, I’ll break his back anywhere from his neck two feet back that you like.”—“Well, if you can just clear the rock with y^r bullet and no more you can shoot—but I wouldn’t if I were you.” Back I went, put the bead on him—waited half a minute to see how close to the rock I could shoot to be sure. I knew exactly what the rifle w^d do at 130 y^{ds} so I said to myself, if I just put a full sight on the rock edge I’ll just clear safely at 60 yds—and so I did and fired. The stag didn’t move—a shiver ran along its back and it tried to raise its head—that was all—it was dead. When we gralloched him the bullet had entered an inch to the right of the spine and passed clean through the centre of the heart—and he weighed 17st 12^{lb}.

We had a glorious picnic next day—and the next I was out again. This time the deer were on the face of a hill, and we could not get at them. The deer were at A and B. We got to C and could only watch them and hope they w^d feed in our direction—but they didn't—and we had to wait till they fed off the forest. About 5 p.m. the coast was clear and we had a heavy climb to the top. We were hardly there when we saw the tips of a pair of antlers—and for more than an hour we crept about on our bellies. The wind very light and shifty, the stags (there were two) unable to make us out and continually moving. At last, just as it was getting dark, I saw first a pair of horns come up behind a rock at 130 y^{ds} from where I was—and finally two stags came and looked over—showing only their necks. They saw something and



couldn't make out what. I put my bead on the neck of the bigger one, but could barely see and took it off and on once or twice to make sure—then fired, and to my great joy over he went. I loaded and went up—but he was unable to move and the gillie gralloched him. He was only 14st 5^{lb} but a good head. It was now getting dark and before I got to the pony quite dark—and then a 6 mile ride. I found all at dinner—and tremendous rejoicings when they heard of my luck. After dinner we had the pipes up, turned up the servants and danced reels till midnight.

On return to London we went again to the McCleans at Rusthall, Tunbridge Wells, where I left Bella and ran over to Paris for 5 days to attend the International Geodetic Congress—where I proposed my scheme for an arc of Meridian along the 30th Meridian from the Cape to Cairo. It was well received.

After a few days at Rusthall we returned to London and then went together to Botley on a few days visit to Adm^l Sir Noel and Lady Salmon (one of our old admirals here) and then on to the Isle of Wight for a few days with Ad^l and Lady Hunt Grubbe (another of our old admirals). We spent the remaining 3 weeks of October in London, where everyone was very kind to us. I gave a farewell dinner to my scientific friends at the Athenæum—Lord Kelvin, Hunt Grubbe, Mr. McClean, Frank Newall, Christie, Lockyer, Downing, Sir John Burdon Sanderson, Sir Bartle Frere, Sir Wm. Westland (son of old Westland the banker), Adm^l Sir Fred. Richards, Ad^l Sir Wm. Wharton (the Hydrographer), Sir John Ardagh (head of the Intelligence Dept. of the War Office), Knobel (Pres. of the R.A.S.), Prof. G. Darwin, and we sailed on the 3rd Nov. for the Cape.

Bella was wonderfully better, but her old headaches came back on her arrival here. However I am thankful to say of late she has been ever so much better and is full of all sorts of plans—looking after soldiers' graves, a bazaar she is to get up here in November to raise funds for our church, etc., etc.

We saw a good deal of Harry at home. He was with us all the month of August at Harrogate. He has grown a nice boy—but not at all clever, and failed for his first army Exam. the other day. Fred is going to be a mining engineer—passed his matriculation examination and is at the South African College and hard at work. Bruce is a fine little chap, but very small for his age, but very bright and keen.

* * * * *

All goes well at the Observatory. We are just going to put up a New Transit Circle—I have also two big surveys on hand. The Anglo German Boundary Survey between British Bechuanaland and German S.W. Africa—(both Governments having placed the work in my hands), and the geodetic survey of Rhodesia.

The miserable tail end of this war drags along. Marauding bands of Boers go about, plundering and stealing and occasionally catching a train. They never stop to fight—and are as hard to catch as bush-rangers. I think they are getting out of ammunition now.

Fred has joined the town guard and promises to be a good shot.

Do you ever see Sir Sylvester Browne—if so remember me kindly to him—Bella also.

How is y^r dear little wife? We long to see her. Give our dearest love to her and the same to you. This is a tremendous letter—but I hope it will interest you.—

Y^r loving brother,

DAVID GILL.

The love for sport, in its truest sense, is manifest in the above letter, written in 1901. Even in South Africa he often went buck-shooting in Natal, Beaufort West, etc., to recuperate. But this taste had the fullest scope in his old age after settling at home. He then found that the fixed focus of old eyes interfered with accurate rifle shooting, so latterly he always used a telescope sight when deer-stalking. He went regularly for this sport to Ardkinglas, Sir Andrew Noble's estate on Loch Fyne. Miss Noble has sent some recollections of his enthusiasm.

FROM MISS NOBLE

JESMOND DENE HOUSE, NEWCASTLE-ON-TYNE,

March 1, 1915.

DEAR LADY GILL,—

* * * * *

I think one may say that he was happy with us, and it was a great joy and pride to feel that it was so. One day he had shot stags right and left I think, at all events there were two remarkably fine shots—and he insisted on waltzing with me after dinner in honour of the event—we were a very small party—and my mother had perforce to play a waltz—and we danced round with great gaiety. But he was always contented and happy—another day he came in just as cheerful as ever—but he had shot nothing—no, but a *lovely* day—a magnificent stalk—they had seen the tip of the horns with a glass and crept up—and behold it was a dead stag! “But I had all the fun and excitement of a stalk!” He was always so contented and cheerful and full of fun—besides his “right judgment” in all things made it a privilege to hear him talk.

* * * * *

Yours affectionately,

LILIAS H. G. NOBLE.

Mrs. Lowe, of Gosfield Hall, Essex, sends notes of some days Gill had with her pheasants.

He shot with us on Oct. 13, 1910. I remark the undergrowth was so prodigious after the hot summer that no ground game could be seen. The bag was 349.—Again Nov. 9, same year, when he told this story: Two Scotsmen met one another. "Well, hoo are ye an' the wife?" "Oh! the wife's deid." "Ah so, and hoo was it?" "You see, I found her poorly, so I just gave her a powder the Doctor had once put up for me that I didn't use—an' in twa hoors she was deid. Eh, mon, I was terrible glad I had na ta'en it mysel!"

1911. He shot on October 12 and the bag was 426 ph^{ts} and a total of 440. 1912. He shot on October 11th, temp. 54°, a brilliant day. The bag was 504, and he came home triumphant and in the bonniest of spirits. O so merry all the evening.

The same year 1912. I have the entry "my dear delightful friends arrived, Sir David Gill and Mr. J. Murray. At the Cock shoot the bag was 332. Mr. John Murray stepped into a hole and hurt his knee." But we had a bright evening and Sir David wd agree with me "there's nothing half so good as laughing."

1913. November 13—Our Cock shoot and a cold bleak day. Sir David and Mr. Murray Sen^r were both with us. It poured in torrents at 3 o'clock—and the guns came in *soaked* through—but Sir David as cheerful as ever—and so jolly and kind, and so afraid we should think he had not enjoyed it. I thought him however looking aged and his hair much whiter.

Further accounts of Sir David's love for outdoor life and sport in the highlands appear throughout his correspondence; and the chapter which will follow, dealing with his mode of spending the summer and autumn, in the years of his retirement from the Cape, tells the same tale.

CHAPTER XXVI

LIFE IN LONDON FROM 1906

34 De Vere Gardens—His "Study"—His friends—Lady Gill's drawing-room—His activities in London and Paris—His troubles—London amusements, and occupations.

WHEN the Gills came finally home, some one said to him, "I suppose you will take up your abode in Aberdeen or the quiet of the Highlands?" To which he replied, "I shall settle down just as near to Burlington House as my income will allow me." He had no intention of disconnecting himself from the scientific associations of his life even if his days for the regular observation of stars were over.

After a short time spent in looking round, they established their *lares* and *penates* in a charming flat with a distant prospect over London, at the top of a house, 34 De Vere Gardens, Kensington. Here, in his comfortable study, he used to receive his friends, scientific or otherwise; and here were discussed many of the great astronomical instruments and researches with which he was in close contact, dealing with the progress of astronomy in all parts of the world. His advice was eagerly sought, because his vast experience both in construction and operation was, in many branches of the science, quite unrivalled. His encouragement, too, was enthusiastically given to callers from all parts of the world. The astronomer who had new ideas received welcome hints. The one who felt the drudgery of a long research left that room with an access of youthful enthusiasm. The one whose health was broken by his exertions was

helped to wait in patience, and, when this was possible, some of his labours were moved to the older man's shoulders. The astronomer who needed support, or even financial assistance, found in that study a plan devised by which his labours would be appreciated in the proper quarter at home or abroad, and his difficulties removed.

Every one who was honestly doing his best, on leaving that study felt how much there is to be done that is worth doing; and what boundless happiness was open to any one who could see in the work of to-day "a connected portion of the work of life," a something worth striving for.

He loved to have in his study a selection of the younger men engaged in the active pursuit of astronomy, to learn all about their work, to argue for or against some project, to suggest alterations or improvements, and generally to enjoy himself in a pleasant "crack" over a cigar about matters of common and absorbing interest to them. Seldom did any of these friends leave his study without finding that his own love for science, and enthusiasm for his work, had been stimulated.

At other times the study at De Vere Gardens became the scene where was rehearsed the line of action to be taken in some co-operative work of science. Many a plan was brought to birth at the Royal Astronomical Society, the National Physical Laboratory, the Astrographic Congress, the International Bureau, the Congress of National Ephemerides, or the Commission des Instruments et Travaux, whose origin could be traced to careful discussion in the study at De Vere Gardens.

During his retirement one of his greatest joys was receiving visits from foreign astronomers. Professor Kapteyn often ran over from Groningen, alone or accompanied by his wife, to stay with the Gills in their flat and to discuss some question of sidereal astronomy; and he nearly always made London a halting-place in his annual voyages to and from Mount Wilson. These occasions

were seized upon when convenient for getting together many other astronomers, when the *Carte du Ciel* or star streams would be discussed, or the plan of selected areas, or the average parallaxes and proper motions of stars differing in magnitude, or the evidence for a light-absorbing medium in space, or a rational system of photometry. Many a symposium of congenial souls discussed there, often in a cloud of tobacco, the nebulae and star problems of the outer realms of space.

At other times the table would be littered with blueprints of machinery, while the director of some foreign observatory picked up suggestions about mechanical or optical construction.

When he had a morning to himself there was plenty of work to be done, because his astronomical correspondents included the occupants of half of the world's great observatories. Moreover, he had much to do in the writing of papers and articles and lectures, while he was never free from the duty of completing in spare hours his *History of the Cape Observatory*, forming an Introduction to the *Description* which he had finished before his retirement.

The wide range of his experience and knowledge in literature, science and many arts always kept conversation around their hospitable table at a high level. The subject depended entirely on the tastes of the guests.

Thus it happens that many a man who thought he knew him well knew only the part of Sir David's mind that coincided with his own tastes. One sportsman with whom Gill often went out deer-stalking said to the writer, after his death, "I knew, of course, that Gill went in for astronomy, but it never occurred to me till I read the obituary notices that he was anything like the greatest astronomer in the world. Anyway, he was a good sportsman."

On the other hand, an astronomer who knew him very intimately writes: "No one, I should think, ever talked



THE STUDY, 34 DIE VERE GARDIENS.

"We are a very Darby and Joan old couple, who like to be together as much as possible."

shop more industriously and with keener pleasure. It seemed impossible to talk of anything else, except the things he was continually revolving in his mind."

Had this friend met him at a country house party he would have had his eyes opened.

The Astronomer Royal, Sir Frank Dyson, describes his first introduction to the study at De Vere Gardens.

Shortly after his return from the Cape he invited me and a few other astronomers to meet Kapteyn, who was staying a few days in London on his way between Groningen and Mount Wilson. This was the first of a number of delightful evenings I have spent with him of which I shall always retain the memory. On this occasion Gill took us into his study after dinner, and promptly started the conversation on star-streams. "Newcomb once said to me," he remarked, "'There is nothing I enjoy so much as a talk with astronomers about astronomy'; and I entirely agree with him."

The evening quickly passed in conversation on astronomical topics, diversified by an occasional reminiscence or a Scottish story; and one left with the feeling that it was a splendid thing to be an astronomer, that there were so many interesting things to do, and that it was a great honour to be in the succession of such a man as Gill.

Several times it was my good fortune to go with Gill to Paris to one of the astrographic or other conferences. All the astronomers there seemed to be old friends of his. Talking to this one and that, he assisted the conferences most materially in coming to practicable and useful decisions. He had, of course, carefully considered the questions beforehand. But constantly he would invite different astronomers round to the St. James' Hotel, where he stayed; and in the lounge of the hotel various points were thrashed out, with the assistance of cigars, and sometimes French spoken "in all the languages of Europe."

The conversation did not keep at all strictly to the subjects to be discussed at the conference, but often took a more personal turn. At these friendly meetings one saw how much Gill enjoyed the company of his fellow-astronomers, and how interested he was in their welfare and the work they had in hand.

After his return to London he retained a great interest

in the work of the Cape, and nothing gave him more pleasure than the success of the Victoria telescope and the new Transit Circle, and the skill with which they were handled. He frequently showed me letters he had received from Hough and Halm, and he often spoke enthusiastically of members of his former staff.

Two of his friends, to whom he was most attached throughout his life, were Admiral Richards and Admiral Wharton, who was Hydrographer during a large part of Gill's tenure of office.

Everybody who knew Gill saw his obvious delight in everything he did. He had a good many interests besides astronomy, and whatever he did was done with enthusiasm. This applied from Astronomy, which he did surpassingly well, down to golf, from which he derived as much pleasure as exercise, but at which he did not excel.

The visitors to De Vere Gardens soon learnt what the Cape had known for twenty-seven years, that this devoted couple *radiated* happiness. Some one once said that Sir David Gill must have learnt the discovery made by Buddha Gautama, that perfect happiness comes from perfect selflessness. It is perhaps more true to say that he never learnt it—that it was born with him to know that he would be much happier in doing something to make somebody else happy than in seeing his own body lolling in ease, or striving to get the better of his fellow men. He certainly loved his wife and loved astronomy far more than he loved his own bodily pleasures. There is abundant evidence in support of these assertions to be found not only during his late years, but in the earliest accounts of his childhood; inborn selflessness, with love of truth, and patience, were part of him.

To the writer, this quality of his nature shines out as the sole and sufficient cause of Sir David Gill's greatness and happiness. Carlyle says that this is the "divine relation" which in all time unites a Great Man to other men. He goes on—

Of a Great Man I will venture to assert that it is incredible he should have been other than true. It seems

to me the primary foundation of him, and of all that can be in him. This I would say : his sincerity does not depend on himself ; *he cannot help being sincere.*

If any other person who knew David Gill from boyhood to old age, and who has read the outpourings of his soul in his letters to numerous devoted friends—without ever finding a word of unkindness or a word of hate—if such a man can honestly say he thinks the above opinion wrong, then he must find some better explanation for the very real happiness that emanated from Gill to the hearts of those who sought his counsel or gained his friendship.

It must not be supposed that astronomers alone claimed Sir David's time. It may surprise some of these to know that they did not form one quarter, perhaps not one-tenth, of his intimate personal friends.

Lady Gill did not interrupt the science discussed over cigars in the study, but in her drawing-room one met many of the brightest and most charming of those best known in London society. It was just the same as at the Cape : if you lunched with the Gills you were sure to enjoy yourself and likely to form new and delightful acquaintances.

Certainly the study is not the only room in the De Vere Gardens flat to which people now look back with thoughts of happy hours spent there. Lady Gill's health was too uncertain to enable her to entertain on an extensive scale, but perhaps all the more on that account the meetings of friends there on the most delightful terms left a flavour of satisfaction and mental enjoyment which gave to them a very unique pleasure.

It soon became obvious that Lady Gill could not undergo the fatigue of enjoying much of their friends' hospitality. Yet neither of them wished to pass out of the lives of their many friends. So it was agreed between them that Sir David should go about as much as possible, and tell his wife of all the nice people he had met in their friends'

houses. This plan solved the difficulty to their entire satisfaction. The result is that Gill's engagement books, which he always carried in his pocket, now show an amount of dining out, and lunching out, and afternoon calls such as the gayest young bachelor could hardly exceed. The Cape had been a place for making acquaintance with every distinguished person who ever went there. Their number was great, especially during the South African War. Add to these his originally wide circle of friends at home, and you find a basis for the creation of the very widest circle of chosen friends to welcome at their homes so charming a guest as Gill ever proved himself to be.

Although Lady Gill's uncertain health prevented her from dining out with her husband, the extraordinarily wide extent of their intimate social friendships was remarkable. These friends, for the most part, joined in her interest in all pertaining to the Cape and its people. Thus, when she saw the need of funds for the church at Observatory Road, she was able to create and hold a bazaar in the flat at De Vere Gardens, which was visited by their friends, and thus a handsome donation was provided for the wants of their old church near the observatory.

In the old days when Gill used to come to London from the Cape he was a very unconventional fellow. Residing with his friend, Mr. Kershaw, in Hyde Park Gate, he would walk every morning to the Admiralty or to Burlington House. Those were the days when every gentleman in London, without exception, always wore a top hat. It used to be a little startling, then, for any man to meet his friend, David Gill, tearing through the Park in country get-up and a white wideawake. He was always in a hurry in those days. Occasionally in the old days he looked in at a small scientific club with a habitation in Savile Row. Settled now in London, he submitted with due decorum to the necessary conven-

tions, and, naturally enough, the increased weight of advancing age and the portly figure diminished the buoyant elasticity that his friends recalled; so that in these later days we were not so inclined to look upon him as an athletic schoolboy.

Nevertheless, to the last he was an active man, and always preferred to walk the whole of the way home from the Athenæum or Burlington House. If the figure and gait, modified by the growth of flesh, led him in the direction of a more conventional progress, yet it was guided by a spirit no less light, no less cordial to friends met on the way, than in the old days when he might be "pegging away" at the Admiralty with dogged persistence for a heliometer.

It must not be supposed, however, for one moment, that his own receptions at home and those daily welcomes at the houses of friends completed the total of Gill's undertakings when he had finished his morning's work at correspondence, etc.

His sound judgment was requisitioned on the councils of scientific societies of which he was a member, especially the Royal Society and the Royal Astronomical Society. In 1909-10 he was president of the latter, and afterwards its foreign secretary. He held the presidency of other societies. And not only was he thus frequently chosen on account of his knowledge, but by this time the value of his name alone on the councils of less distinguished societies was recognized as helping their cause. So long as an institution was connected in any way with the advancement of science he considered it worthy of support. He did not disdain the presidency of smaller groups like the Optical Society or the Institute of Marine Engineers. He did not have that aversion, common to many, from supporting those societies in which any one, simply by paying a fee, could be enrolled as member of a society with a scientific title. He held that every one who wished to be included in the list of "scientific men"

should be encouraged. He was a member of the Science Guild. In this way he even went out of his own line to accept the presidency of the Research Defence Society, whose work is mainly directed against those who oppose vivisection. In Paris he had witnessed Pasteur's inoculations of guinea pigs, and knew the great benefits accruing to mankind from these and similar minor operations, and he was able to write an effective presidential address. But he had no actual knowledge of the painful operations on animals lasting for weeks, and often conducted only for what may be called scientific curiosity as to the causes of phenomena. This is one of the rare cases in which he was active outside of the sciences of which he had practical knowledge. If he had consulted his great friend, Lord Kelvin, it is not improbable that he would have refused the presidency on the grounds that it dealt with a science of which he was not a master. For Gill had an affection and esteem for the opinions of Lord Kelvin amounting almost to veneration; and the writer was much impressed when, at Pitlochrie, he happened to mention the very strong terms in which Lord Kelvin had spoken to him against vivisection, and Gill looked up with a jerk. "Did he really say that?" On being assured that it was so he seemed to be conscious for the first time that on this point differences of opinion could exist among great scientific men.¹

No adequate notion could be formed of Gill's main activities and interests without some account of his international commitments. Of course, he regularly attended the meetings in Paris connected with the astrographic chart and catalogue, and the part which was there assigned to him has been described by Pro-

¹ Lord Kelvin's considered opinion was that "experiments involving such torture to so large a number of sentient and intelligent animals are not justifiable by either the object proposed, or the results obtained, or obtainable, by such an investigation as that described by Professor R——." (*Life of Lord Kelvin*, by S. P. Thompson. London, 1910, p. 1105.)

fessor Kapteyn in an article from which quotations will be made presently (pp. 332, 333). The guidance of a master mind had become all the more necessary from his failure to carry out the scheme of a central bureau for the measurement of the photographic plates and their reduction. It is possible he may have indicated lines of action that were wrong or capable of improvement in the paper he was instructed at the beginning, in 1887, to draw up as a basis of discussion. It is possible that the independent action of each observatory in the reduction of its own observations may have evolved more refined methods than he originally proposed. But this independent action has led necessarily to vagaries in methods, in the degree of accuracy sought for, in the delay of reduction work, and in the form of publication, whose worst effects needed even for their partial elimination a master hand for guidance. Even Gill's powers of organization were taxed to the utmost after failure to establish his central bureau, and the best we can hope for is that this magnificent co-operative scientific enterprise may soon be completed and yield results entirely in keeping with the hopes of its original founders.

Concerning Gill's other international commitments an excellent, though perhaps rather technical, account is given in the following statement by Major MacMahon, R.E., F.R.S., his colleague and fellow-worker in some of the matters referred to.

Sir David Gill was unanimously elected the British Member of the Bureau International des Poids et Mesures in February 1907 in succession to the late Mr. Chaney, who had been head of the Standards Department of the Board of Trade with an Office and Standardising Laboratory at 6 Old Palace Yard, Westminster. The Committee of the Bureau met every two years at the Pavillon de Breteuil near Sèvres. He attended the meetings in 1907, 1909, 1911 and 1913, and the International Conference on Weights and Measures in Paris also in 1907 and 1913.

At the meeting in 1907 he was appointed Member of the Commission des Instruments et Travaux. As a member of this body he proposed the periodical comparison of wave-lengths of light permitting a precise definition with the International prototype mètre. The meeting recommended this proposal to the Committee. Sir David took part in the discussions of the Commission and the resolutions of the Commission were adopted. He at the same time took part in the discussion raised by Dr. Stratton, who represented the United States of America, to modify the Convention du Mètre so as to permit the establishment of a permanent "Comité Annex" to deal with questions relative to units and measurements of light, heat and electricity. Sir David expressed the opinion that the International Committee should exercise great care and go slowly, and enlarge the scope of operations little by little.

Following the meeting of the Committee the Sextennial Conference was held in Paris, and to this Major P. A. MacMahon, the Deputy Warden of the Standards of the Board of Trade, was the British Delegate and Sir David Gill attended ex-officio as the British member of the International Committee. The Conference was welcomed at the French Foreign Office by M. Pichon in an interesting address and the business of the conference was mainly formal, the most important business being the recommendation that there should be an International metric carat of 200 m.g. for weighing diamonds and other precious stones. All the Governments which were represented on the Bureau were to be asked to legalize such a denomination. For the rest the proceedings were marked by much entertainment and hospitality. At all these gatherings Sir David Gill was in his element, particularly when ladies were present. His great personality and charm of manner were much in evidence at a banquet given to the Conference by the late Professor Becquerel. The proceedings were unfortunately arrested by the sudden death of Professor Loewe, the Director of the Paris Observatory. Sir David Gill was one of those who represented the Royal Society and also the Royal Astronomical Society at the funeral.

At the meeting of the Committee in 1909 Dr. Benoit, the Director of the Bureau at Breteuil, called attention to the services rendered by Sir David Gill to the Metric

system in counselling the Indian Geodetic Service to express the measure of the Indian base in mètres. Sir David communicated the results obtained at the National Physical Laboratory, Teddington, with a piece of transparent quartz. It was found that at a temperature of 400° C. the change of length produced was less than

$$\frac{1}{2,000,000}.$$

The Committee asked for information as to the manufacture of this "quartz fondu," and for samples so that experiments might be made at the Bureau to test the suitability of the substance for constructing a copy of the mètre. Sir David also raised at some length the question of the mètre being defined as the length of one kind of metal at 0° C., whereas in practice other metals are used at other temperatures. This meeting was succeeded by a meeting of the Astrographic Congress, Sir David being present. A banquet was given at the Observatory—plays were performed afterwards by actors and actresses from the Théâtre Français and later on there was a dance. Sir D. Gill was in the best of spirits, made a speech in French at the banquet, and later danced nearly every dance.

At the meeting of 1911 there was a discussion regarding "quartz fondu" as a material for standards of length, and it was stated that it had been found impossible to engrave the defining lines on the material satisfactorily. Sir David read a paper by Mr. G. W. C. Kaye of the National Physical Laboratory on the construction of a mètre of transparent quartz. The Sub-Committee on his proposition suggested to the Committee that the quartz mètre destined for the Indian Weights and Measures Service should be verified at the Bureau, and in case of the comparison being found satisfactory, that one should be procured for the International Bureau. This was adopted by the Committee. At a later session he suggested that the Committee should add to their interests the subject of the thermodynamic scale of absolute temperature. He was appointed Member of the Sub-Committee to consider whether the Convention du Mètre should be modified so as to treat all questions of unit standards and physical constants. He reported to the Board of Trade that certain scientific matters which came before the Committee for discussion included the finality of the determination of the weight of a cubic

centimetre of water and the peculiar value of tantalum as a material for the construction of standards of mass.

As regards the use of tantalum for metrological purposes its extreme hardness, its high specific gravity and its absolute resistance to attacks by nitric, hydrochloric or sulphuric acid apparently render it superior to platinum or iridio-platinum as a material for standards of mass. Its cost in the rough is much less than that of platinum, and although its high point of fusion and its great hardness render it difficult to work, it can be produced in the form of weights far cheaper than platinum.

When in Paris Sir David Gill invariably stayed at the Hôtel St. James and Albany, and the last time he was there, in October 1913, he spent a strenuous day at a flying ground near Paris. He was very popular with all his colleagues of the Bureau and of the Conferences, who without exception were his warm personal friends.

Concerning the Astrographic Congresses in Paris, Professor Kapteyn has given us his intimate observations of Gill's activities in the *Astrographic Journal*, 1914.

Outsiders who have seen him at work at these congresses may have been under the impression that it was the geniality of his person, his infectious enthusiasm, and strong self-reliance which carried the day. But those who had followed matters closely would know how carefully he had studied every detail of the matter to be discussed, how long beforehand he had extensively corresponded with the most capable and most interested persons, and how he brought many of them together a few days before the date of the congress, not only to arrange the programme for the proceedings, but also to discuss informally all the main points. During the whole of the congress, too, he would bring the ablest men together for these informal discussions. In these Gill would always play a prominent part; sometimes his impetuosity would make it far from easy for those opposed to his views to explain their standpoint. It might be some time before Gill would really give attention to what they had to say, but that moment having come, they could wish for no better listener, and if they succeeded in showing that their point of view was more nearly correct, no man would be

quicker to recognize his error than Gill. No man could be long with him without feeling that here was a man to whom the real interest of science was paramount, a man who was always ready to sacrifice any pet plan of his own to the real interest of astronomy. A favourite expression of his, in giving up his opinion, would be: “The man who never made a mistake never made anything.” I cannot help thinking that such personal qualities—his indomitable energy, his broad-mindedness, love of his work, kindness—his manliness in the best sense of the word; in short, the charm of his strong personality, had almost as much to do with his achievements as his qualities as a scientist.

There was no happier man in London during these days than Sir David Gill, and few were the source of so much happiness to others. The constant worries he had experienced at the Cape from attempts to interfere with his work no longer existed. He had the joy of feeling that now, in personal contact with the worlds of London and Paris, he had a certain influence which he could use in advancing astronomy. This he invariably exercised in favour of honest, well-directed, and systematically discussed observation. He did not encourage the brilliant speculator who was wanting in patient effort, or who would ask him to give up well-tried methods of accuracy in favour of some half-digested notions about vague possibilities in other directions.

Of course, this man had his troubles. Who has not? In 1907 Agnes Clerke died; in 1909 Professor Simon Newcomb and Bryan Cookson; in 1910 Sir William Huggins; in 1912 Admiral Richards and Sir George Darwin; in 1913 Lord Crawford; and the illnesses of Elkin and of Hale affected him almost as much. The one constantly recurring grief arose when his dear wife was ill. He suffered deeply, and when he had to be away from her every one could see that his constant thought was with her. Apart from this, few worldly matters upsetting to most people affected his equanimity

or made him sorry for himself, or wish others to be sorry for him.

There were very, very few of his most intimate friends who knew anything of the pecuniary loss he suffered through having invested money at the Cape under the very best advice he could get there. Few know that he had to go to work again to make up this loss. Dr. Elkin was always on the most intimate terms with the Gills, and in a letter to him, in 1910, Gill mentions this casually and as a matter of no consequence.

TO ELKIN

34 DE VERE GARDENS, KENSINGTON,

April 17, 1910.

MY DEAR OLD FRIEND,—I wonder what you can think of me, for my long silence is a disgrace to friendship.

The fact is that I have had great anxiety and immense amount of work. . . . My worry and anxiety has been about my wife. She fell ill about the middle of June last.

* * * * *

Our money matters at the Cape have gone from bad to worse. The investments (1st mortgages on houses) which used to bring me £600 a year, brought me £180 last year—with repairs and taxes to pay, and little or no rent—and no one will buy the houses at any price.

So I have had to go to work again. I have written some articles, given a few lectures, but have been chiefly busy (so far as money-making is concerned) in advising Governments about instruments, etc.

The Transvaal Govt has employed me in connection with the supervision of the plans and business arrangements of the Johannesburg Observatory—a matter that has cost me an immense lot of labour—but work that I love—and I make it my business, *inter alia*, to do these things.

The Govt of India has employed me to design their new Laboratory at Dehra Dun for standards of measure, and the comparators for 4 metre bars, Jaderin wires, etc. I have also been inspecting Geodetic Instruments for the Govts of Australia and Siam.

But you have always been in our thoughts, and I have always had it in mind to write to you.

* * * * *

We are both terribly sorry to hear that you have been obliged by ill health to retire.

* * * * *

Percival Lowell is over here just now. He held forth one afternoon at the R.A.S. Showed us photographs of Mars on the screen, and pointed out Canals—which none of us could see. The same evening he gave a lecture at the Royal Institution—and here again I failed to see any Canals, but his planetary photographs were most beautiful.

But I have been studying some of his slides since at leisure, directly, and I am bound to say that I have seen a few markings which are quite unmistakable—such as Schiaparelli and Lowell have described, tho', of course, not in the profuse abundance mentioned and described by them.

I must say that I can no longer doubt that there are markings on Mars of the kind, but I cannot agree with the interpretation that Lowell puts upon them.

But there is no question that, at Flagstaff, Lowell must have a steadiness of definition which is extraordinarily great—and his work is of a very high order.

Now, my dear old chap—forgive me—Believe me, you have no truer friends than my wife and I. We both join in love to you and your dear little wife, and in the hope that you will long be spared to enjoy *y^r otium cum dignitate et honore*,—Y^r true old friend, DAVID GILL.

He undertook the children's Christmas lectures at the Royal Institution (as he writes to Kapteyn) "for filthy lucre," and gave other popular lectures, for which he had no great aptitude as he did not know how to slur over difficulties after the manner of popular lecturers; and he started a fairly profitable business as a consulting astronomical engineer. This part of the work he thoroughly enjoyed. But scarcely one of his friends knew that he was following the noble example of Charles Dickens or Mark Twain under similar conditions. Of course, he was not seriously crippled by such an affair, but while careful

in his expenditure, he was one of those free-handed men who are always ready with a bank-note when a real case of distress comes before them. His correspondence shows some cases where he was imposed upon.

Sir David Gill derived much exercise and pleasure from golf. Mr. Alexander Davidson, his old student friend at Aberdeen, who had also visited him at the Cape in 1898, induced him to join the Royal Wimbledon Golf Club and the Wimbledon Curling Club, and writes—

Though an indifferent exponent of either game, no man could throw himself more completely and more whole-heartedly into the spirit of play than did our many-sided astronomer. I remember one occasion when we were curling at Wimbledon in the winter of 1906-7 which he was fond of talking over with great glee. A scratch match at curling was got up in the afternoon—England *v.* Scotland. Gill and I were among the Scotch, and notwithstanding the enthusiasm of my friend we got into a very despondent condition as the game progressed, being four points down when we had to play the last end. As luck (and perhaps careful play) would have it, we unexpectedly in that end got five stones in and won the match. Then Gill's exuberance fairly boiled over, and cheering vociferously his example so infected the rest of our team that we fell to shaking hands and drinking healths all round, and had we been Frenchmen instead of Scotsmen I have no doubt we should have embraced each other in the way that foreigners do.

Gill was no adept at any games like golf or billiards, which require constant practice. Yet he was ever willing to take a hand and to do his best. He even entered a billiard handicap at the Athenæum Club. On that occasion his opponent, settled by lot, was a magnificent player, the best in the club at that time. By his handicap Gill began the game a long way ahead of his opponent. He pegged away in the hopeless task, every little score, or miss, on his part being generally followed by a fine break on the part of his opponent, and the distance

between them rapidly diminished. At last he exclaimed in despair to a friend, "I feel just like a rabbit with a weasel after me."

The following letters to Elkin exhibit some of Gill's activities from 1908 to 1910.

34 DE VERE MANSIONS, KENSINGTON,
December 15, 1908.

MY DEAR ELKIN,—The *Comptes Rendus* has just arrived, and I rejoice—we both rejoice—to see that the French Academy of Sciences has awarded the Lalande Medal to you and Chase. We send our most loving and sincere congratulations.

They have just created a new Chair—Astrophysics—at Cambridge, and appointed Newall to fill it. That also has given us great joy.

* * * * *

I am at present very busy about Astrographic Congress matters—for the ré-union at Paris, April 19-26. We hope you are both coming.

Write soon. With our united love.—Ever thine,
DAVID GILL.

34 DE VERE GARDENS, KENSINGTON,
1909, March 14.

MY DEAR ELKIN,—Y^r letter of the 26th Feb. duly reached us with its burden of sad news. . . .

We too have had just a similar sorrow.

* * * * *

We go on the 22nd inst. to Paris. . . .

On the 31st we go to Porto Fino—near Genoa—to spend a fortnight with Lady Carnarvon at her beautiful place there, returning Apr. 17 to Paris for the Astrophotographic Meeting.

On Friday last I took my seat as Pres. of the R.A.S. . . .
We are not coming to Winnipeg.

* * * * *

But we have made up our minds—my wife and I—to come across for the Solar Union meeting in 1910. . . .

I fear very much I shall not be able to see dear old Newcomb when I come. He wrote me such a programme and was to go about with me. But a day or two ago I

had a letter from his daughter, Mrs. McGee, from Paris to say the operation he recently underwent disclosed a malignant tumour, all of which could not be removed. One knows too well what that means. Apparently he does not know, nor do his American friends know, how serious is his case, for Pickering wrote me that Newcomb had a *benignant* tumour, and was planning long journeys. So apparently his American friends do not know. Thus please keep what I tell you as confidential lest the matter should get to his ears.

Mrs. McGee we hope to see in Paris before she leaves it on the 25th or 26th inst. to sail from this Country on the 31st, "unless she is cabled sooner."

* * * * *

Bella will write to your wife soon. Our love to you both.—Ever thine,
DAVID GILL.

34 DE VERE GARDENS, KENSINGTON,
December 12, 1910.

MY DEAR ELKIN,—. . . I have had a great deal of work in connection with the design of the Johannesburg telescope 26 in. aperture and with the designs for a 24 in. aperture equatoreal for Ristenpart at Santiago, including rising floor and dome. I have exactly similar work, namely a refractor of 35 ft. focus (aperture whether 24 or 28 in. not yet decided) with a rising floor and dome for Nicolaieff, and also a reflector of one metre aperture equatoreally mounted for the Crimea [Semeis].

* * * * *

I have seen a good deal of Hale since he came over. . . . He has brought me the working plans of the 100 in. Reflector. . . . I am to report any suggestions in regard to them to Mount Wilson. . . .—Ever thine,

DAVID GILL.

CHAPTER XXVII

LAST DAYS AFTER RETIREMENT (1907-1914)

Seventieth birthday—Monumental book on Cape Observatory—
Illness and death.

HAVING now shown in what direction his occupations lay during the years of his retirement in London, it remains to tell about Gill's manner of spending his holidays in the summer, full of the enjoyment of country life.

The year after his arrival in London, *i. e.* in 1907, he was president of the British Association at Leicester. The preparation of his address naturally occupied his thoughts a great deal. The meeting was a great success, and no one enjoyed it more than Sir David and Lady Gill.

FISHER'S HOTEL, PITLOCHRIE, *September 21, 1907.*

MY DEAR ELKIN,—We are so glad to have your letter from Zermatt, and to hear that on the whole you are better. High bracing air is the thing for you I am sure.

* * * * *

We had a very pleasant meeting at Leicester—and, so far as I know, not a hitch or unpleasantness of any kind.

The mighty atom figured largely in the discussions of Section A, Kelvin approaching the static, Oliver Lodge the dynamical condition. Much talk, little reality—so far as a definite conclusion is concerned.

There were many interesting papers—many of which I could not hear as the President is expected to visit all the sections.

The local arrangements were excellent, and hospitality unbounded.

We came from Leicester to Aboyne on Deeside, which

I made a centre, for grouse-shooting—and as Sir Fred. Richards put it I had “a Deesidedly engrousing time,” a vile but accurate description. Then I visited my brother near Rothies on Speyside and then we came on here a few days ago. I have again been shooting here. We intended to go from this to stay with Lord and Lady Kelvin till October—but just as we were starting poor Lady Kelvin had a stroke of paralysis. She has recovered speech and clear thought but her left arm remains without power of motion. We are terribly distressed, for they are both old and dear friends and he is in so many things entirely dependent on her.

We remain here till the 26th when Bella goes to London and I go to Sir Andrew Noble’s place at the head of Loch Fyne—to try to shoot one of his stags.

On the 1st Aug. [Oct.] I go to Glasgow and deliver a lecture there on October 2, returning to London the following day.

On Oct. 7 I go to Paris for the meeting of the International Committee of Weights and Measures and remain there till Oct. 23. A day or two in London and then we go to Pixton Park in Devonshire for 10 days. I to shoot pheasants. Shall you be in Paris between Oct. 7 and 23? if so I fancy that is our only way to meet.

From Nov. 9 to 19 I am giving lectures in Glasgow, Edinburgh and Dundee and then return to London and to work.

Both of us have greatly enjoyed our holiday and are wondrous well.

Yes—let us keep henceforth more in touch. God bless you—our love to you both. Ever thine, DAVID GILL.

TO DR. ELKIN

34 DE VERE GARDENS, KENSINGTON,
1908, *January 20.*

MY DEAR ELKIN,—Don’t think ill of me in that I have been long in answering y^r letter of the 9th Dec^r.

When it came I was just in the thick of starting preparation of a series of 6 Christmas lectures to be delivered at the Royal Institution. They involved an enormous lot of work—far more than I anticipated—for the audience is a very difficult one to please and expects much—not much in the way of deep science—but of pap-food,—peptonized with a continuous flow of experiments,

diagrams and slides—and all “adapted to a juvenile audience.” The juvenile audience ranged from 5 to 93 years of age and they were all pleased. So you see I must have had a lot of work. Indeed, I had to put all my correspondence aside and work at the R.I. laboratory hard for a month or more. One newspaper reporter declared that after lecture V [on prisms and spectra], a little girl in a red hat was overheard to ask her mother, “Why did they put the spectre in prison”!! Two little girls who wore red hats, and whom I knew, refused to go to the next lecture in red hats, and insisted on wearing green ones.

But this is all beside the mark—only to explain my silence.

Now, dear old man, don't worry about this idiotic business of Hastings' criticism of y^r parallax work. . . .

I only wish that Hastings had read and printed his paper, it would have been such fun to demolish him. I always enjoy any criticism of the kind, for example, Rambaut on the parallax of α Centauri. You should try to feel the same way, my dear old man—for if anybody knows about the Heliometer and parallax work you do.

* * * * *

Kapteyn has just been over with us on a short visit and to discuss a lot of things with me. He is “as busy as the Devil in a gale of wind” as old Sir Fred. Richards says. (You must remember Sir Fred. He was our Admiral at the Cape when we first came, and we see him every few days now.)

* * * * *

Bella joins me in warm love to y^r dear wife and yourself.
Ever thine,

DAVID GILL.

In 1908 he received the Gold Medal of the Royal Astronomical Society (for the second time). His holiday took the Gills first on a visit to Sir Frederick Richards at Horton Court from July 2 to 22. They then went, accompanied by Sir Frederick, to Strathpeffer, July 24 to August 19. His earlier grouse plans were interfered with by the illness of his wife. Then they went to Aboyne. He had two days' grouse shooting with his cousin, Colonel Ogston, at Kildrummy Castle, Strath Don. Then at

Aboyne till he had to go to Dublin, staying at Lord Iveagh's, to resign his presidency of the B.A. They left Aboyne September 10 to visit Mrs. Pickering (Lady Gill's cousin) at Kincardine O'Neil, and he shot there. Then partridges in Buchan and a day or two in Aberdeen. September 25 saw him off to Glasgow, Inveraray, and Ardkinglas, where he had a fine stalk. Then motored to Loch Goyle Head, thence to Greenock, Glasgow and London, which he reached October 3.

On October 8 he was at Oxford for the jubilee of the opening of the Oxford Museum. Later he presided at the Paisley century celebration of the Philosophical Institute, "where Coats has given them an excellent little observatory."

In 1909 the Gills went to Paris for the Weights and Measures, then visited the Dowager Countess of Carnarvon for a fortnight at her beautiful place at Porto Fino near Genoa, returning to Paris April 17 for the Astrographic Congress. He was now president of the R.A.S. Lady Gill's sister Bessie, whose health for many years was an anxiety, died on February 11. They buried her in the family ground at Foveran. In the summer they were chiefly on Deeside, and returned to London for the National Geodetic Congress beginning September 21, and continuing in Cambridge September 27-30.

His dear friend, Simon Newcomb, died this year in July.

In 1910 Lady Gill's health broke down and she was under special treatment by Dr. Bruce and his father in Edinburgh.

The serious illness of his wife in 1910 was a great grief to him, and also put an end to hopes which had been on the point of fructifying for some years. In fact, before the death of his friend Newcomb he had been attempting year after year to visit the observatories of the United States and to meet his friends there. He had at last decided to do so in this year 1910, when he could meet all the American astronomers at the great Solar Union

Meeting. The disappointment, when it now became impossible to carry out this plan, was very great indeed.

In this year Sir William Christie retired from Greenwich Observatory, and Mr. Dyson (now Sir Frank) was appointed Astronomer Royal. No one appreciated the service rendered to accurate astronomy by this appointment more than Sir David Gill.

In 1911 the Gills left London on July 14 for Llandrindod for the waters. Then to Aboyne and Pitlochrie, three weeks at each, with much shooting. Then he spent three days with Sir Charles Parsons, shooting his grouse. Lady Gill was then to visit Lady Kelvin while Sir David stalked deer at Ardkinglas, but Lady Kelvin's illness interfered.

In 1912 they did much the same. After Llandrindod, at the end of July, they settled at Pitlochrie as a head centre from which he could go shooting. Fred Powell, his second nephew, was home on leave from India. Gill left him with his wife at Pitlochrie while he shot grouse in Northumberland with Sir C. Parsons, and he also shot over moors in Perthshire, etc. Then they had a week in Aberdeenshire and Gill joined Sir Andrew Noble on Loch Fyne; but was recalled from there to London to attend the funeral of his dear old friend Admiral Sir Frederick Richards. At the close of this year he also lost his very dear friend, Sir George Darwin.

TO LADY NOBLE

34 DE VERE GARDENS, KENSINGTON,
1912, *September 4.*

DEAR LADY NOBLE,—I arrived here at 11.45 last night—train 35 minutes late—and found my wife decidedly better. I have just returned from Sir Fred. Richards' funeral. You will doubtless find in the newspapers a list of those present.

The day was beautiful, so were the surroundings I know so well—and the grand old man was laid to rest in the place he loved, surrounded by old and loving friends.

* * * * *

My wife attended the memorial service at Fulham where about 200 people were present.

My mind is so full of my dear old friend that I can hardly thank you all properly for all the kindness and great enjoyment I had in my too short visit to Ardkinglas.

You were all so kind to me, the weather was so beautiful and the glory and beauty of everything so supreme, that nothing was left to desire—and I did enjoy my sport so thoroughly.

* * * * *

As I write I have received a terrible blow—a letter from Lady Darwin has this moment arrived—she says, “After hoping and hoping that George would recover without an operation, finally he had Sir George Bradford down to consult. He advised an operation. It was done and found not to be gallstones but a growth on the pancreas. He had a night of discomfort and pain but his pulse is good and the doctor thinks he is getting over the shock of the operation very well. The end will come in a few weeks, but without pain.”

I cannot quote the rest of the letter—it is the cry of a loving woman after a perfectly happy married life looking forward to the coming loss—God comfort her.

This is a sad letter to send you—I cannot help it. George Darwin is very dear to me—and his death will be a sad blow to British Science and to many a one who loved and honoured him. I can only hope that the doctors may be wrong—though I fear the worst.

My wife desires to join with me in kindest remembrances to you all, and in hearty thanks for all your kindness to me. She sends her love to you and Miss Noble.—Yours most sincerely,

DAVID GILL.

The following note is at the end of a letter to Sir Howard Grubb, dated October 12, 1912—

P.S. I have received a letter informing me that at the last annual meeting of the Astronomical and Astrophysical Society of America resolutions were passed to modify the constitution by which it was resolved to make it possible to elect one Honorary Member at the Annual Meeting—the Hon. Member not to be an American.

To elect the first Member a ballot was taken, each member writing down on a separate piece of paper the man he thought most worthy to be 1st Hon. Member of the Society. Three fourths of the members, I am told by Pickering, wrote my name—and recommended it to the Council which unanimously elected me. I feel it a great distinction, but I think they could have found a more worthy man.

D. G.

This note will help the reader with a knowledge of the man's character to appreciate the spirit in which he received all such distinctions. On nearly every such occasion, if he happens to be writing to an intimate friend, he analyses the value of the testimony, often discounting the personal friendship which led to it, considers the claims of others, and with no mock modesty rejoices at the evidence of appreciation shown to his labours.

TO M. BAILLAUD AT THE PARIS OBSERVATORY

LONDON, *April 5*, 1913.

MY DEAR BAILLAUD, . . . I have received with much pleasure and gratification from M. Cambon the insignia of Commandeur de la Légion d'Honneur which I owe, I am sure, to your friendly influence, and I am very grateful indeed to you for the good opinion of me you must have entertained before submitting my name for such a high distinction. Monsieur Cambon also showed me a letter from Sir Edward Grey, conveying the consent of His Majesty the King that I might accept and wear this. This is a privilege that is accorded on very few occasions to British subjects in the matter of foreign orders, and I am deeply indebted to Monsieur Cambon for the personal interest which he has taken in this matter.

With kindest remembrances to Madame Baillaud and yourself in which my wife desires to join, and with warmest thanks for your friendly offices,

Believe me, Always yours most sincerely,

DAVID GILL.

The German Order *Pour le mérite* had also been con-

ferred upon Gill, the highest honour in the power of that country to bestow. It may be recalled that, when this honour was bestowed upon Auwers, Gill, in writing to Mr. Knobel (p. 210), said, "I regard it as the highest distinction open to a literary or scientific man." On the evening when he received the news that this order was awarded to him he muttered, more to his pipe than to his wife, "Well! I *am* an overrated man!" This was his honest conviction, Lady Gill assures us.

Sir David Gill's seventieth and last birthday was celebrated at De Vere Gardens on June 12, 1913, with great happiness to all concerned. Numerous letters and telegrams conveyed the hopes of his wide circle of friends that he would be spared for a great many years. These cannot be reproduced. A few letters only are here inserted to show the character of many.

FROM PROFESSOR KAPTEYN, GRONINGEN

MY DEAR GILL,—This day must be a memorable day to all astronomers. But to no one so much as to me and if I wish that you may be spared long to enjoy much happiness and joy, I say nothing but what I have prayed for since the time I first knew you.

This day let me thank you for all that you have been in my life.

The time of our first correspondence was for me a time of great discouragement. With an ardent desire to make something of my life I found that I had been pretty much wasting some of my best years. This has been changed from the moment you entered my life.—I know that I have helped you somewhat in your work; but you have helped me far more and if now, not so far from the end of my career (I am sorry to say), I feel that I have been of some use to our beloved science, I owe this to you. You have given me occasion, help, encouragement and more than all that—friendship. It is not only the astronomer that you have helped on, but the man. I think I picked up something of your great "*Lebensweisheit*," of your capacity of making life a joy to yourself and to

others.—My heart is full of gratitude this day. I have admired and loved you since first we met, no, the first at least, much longer.

Let me conclude with the selfish wish that you let me keep a good place in your affection for the time that we may still have to dwell on this planet and let me add my very best wishes for the health of your beloved wife. Could but wishes be of any avail, how soon she would be restored.—Ever thine,
J. C. KAPTEYN.

GILL TO PROFESSOR AND MRS. KAPTEYN

1913, June 13.

MY DEAR KAPTEYN AND YOUR DEAR WIFE,—I received yesterday not only your telegram but those touching and beautiful letters from you both.

If all you say is true—and I am sure you think and believe it so—the best day's work for astronomy that I ever did was to bring you into my astronomical work—or rather to have the good fortune to accept the aid you offered.—What that has meant for astronomy all astronomers know—and what I feel about it, and all the love and honour I have for you only my wife knows.

Long may you live to adorn astronomy—and if you can be sure of anything in this wicked world—you can be sure of my love and friendship as long as I live.

TO MR. JOHN POWER (at the Cape Observatory)

LONDON, 1913, June 12.

MY DEAR POWER,—I am writing on behalf of my wife to thank you for your kind letter of the 17th May—and on my own behalf to thank you for the kind message for me which it contains from you and yours, and which has just been delivered to me.

I have also received the very welcome and kindly cable from the staff of the observatory which reached me last night. All this has touched me deeply.

I am sending a general reply to Dr. Halm which I am asking him to pass round to the staff.

This evening Dyson, Hills, Hough, Newall, Knobel, Chapman (Chief Ass^t Greenwich) and Prof. E. C. Pickering are dining with me to celebrate my birthday, and telegrams are coming in, including a most touching one from Kapteyn.

He and Mrs. K. will be here on the 16th and 17th and on the latter day I have a gathering of astronomers to meet him. On the 18th he sails for Mount Wilson.

Thank God, my good friend, I am feeling a younger man than when I last saw you nearly 7 years ago—and I am just as full of love and interest in the old Observatory as ever I was. I would write you more but I have many letters to write and little time in which to write them.

But I can never forget your good work and your devotion to the Observatory—and the true friendship you have shown to me.

I am delighted to get from Mr. Hough the same story of your devotion and zeal. I wish I could send you good news of my wife's health—she has been far from well of late—but she joins me in kindest remembrance and love to you and yours.—Ever thine,

DAVID GILL.

TO THE CAPE OBSERVATORY STAFF

LONDON, *June 13, 1913.*

MY DEAR FRIENDS,—I must write you all a few words of thanks for the cable message of heartiest greetings. It is indeed good to be so kindly remembered by those who worked with me so happily and so cordially for so many years.

No one knows better than myself how much I owe to you all—for without your earnest and faithful co-operation the Cape Obs^y could never have reached the position which it now takes amongst the great observatories of the world.

At three score years and ten a man is apt to look back upon his past life and review it in his mind's eye. In doing so I am bound to say, with thankfulness, that in my life the joys have far outnumbered the sorrows, and that the days I spent amongst you at the Cape were amongst the happiest of a happy life, thanks to the common bond of friendly good will that it was my good fortune at all times to receive at your hands.

One of the greatest joys of my old age is to watch the progress of the Cape Obs^y and to find that my old fellow workers are still as keen as ever and that the dear old Obs^y is still to the front and going on to higher and better things.

I write of my old age as my years entitle me to do—but in truth I feel a younger man than I did when I left

you nearly 7 years ago—and I w^d fain hope I may yet be spared for a reasonable number of years to watch the progress of the Obs^y and rejoice, as I do now, in its achievements.

It has been a very great joy to me to see Mr. Hough and to get news at first hand of all that is going on. In his capable hands and with the fine equipment of the Obs^y the possibilities of the future are very great. I earnestly ask you all to continue to him the same good will and the same cordial co-operation which I always experienced at y^r hands, and which you still show to him.

I know he has the best interests of the Obs^y and of y^rselves individually at heart.

It is a great thing in life to have a good and worthy object always in view—and it is y^r duty and privilege to have such an object, viz., the progress of the great scientific institution with which you are connected.

I know y^r goodwill and I think our old friendship permits me now to say such things to you—not by way of reproof, for none is needed, but just to stimulate you all as y^r kind thought of my birthday has helped and stimulated me.

My wife is no less grateful than myself for y^r kindly message, and she desires me to add her thanks and kindest remembrances.

I wish that I could give you a better account of her health, but I am sorry to say that for the past 2 or 3 months she has been suffering more than usual from the old continuous headaches which prevent her from taking part in social life. But these drawbacks do not interfere with her loving remembrance of all her old friends on the observatory hill, and she joins me in our grateful thanks for y^r kind thoughts of us.—Believe me, one and all of you, Yrs most sincerely,

DAVID GILL.

TO DR. ELKIN

34 DE VERE GARDENS, KENSINGTON,
1913, July 6.

MY DEAR ELKIN, . . . I have had a lot of work in connection with optical glass—am president of a Committee appointed by the National Physical Laboratory¹—

¹ [The success of Sir David Gill's efforts are told in the following extract from the *Royal Society Report of Council*, 1915, p. 9 :

and Messrs. Chance of Birmingham are making great efforts—so that I think our troubles will ere long be over. But, as matters stand, we have not got a single disc for any of these telescopes [Johannesburg, Santiago, Nicolaieff, Semeis] except the disc for the 40-inch reflector.

The comparator for 24 metre tapes is off to India. The 4 metre comparator has been a long time under trial and used for determination of temperature coefficients, and I finally passed it as perfect a few days ago.

On June 12 I celebrated my 70th birthday—and Pickering, Dyson, Hough, Newall, Chapman (now Chief Assist. at Greenwich), Hills and Knobel dined here. On June 16 Kapteyn and his wife came to London on their way to Mount Wilson, and the following afternoon we had an astronomical convention at my house with most of the above, and Eddington, Rambaut and Schleisinger added.

* * * * *

Ever thine,

DAVID GILL.

Lady Gill writes—

On that 70th and last earthly birthday after David's guests had left (and he had gone to the kitchen to shake hands with the cook—now my valued maid) he burst into my room like a schoolboy with a face of radiant joy, exclaiming, "The happiest birthday of a happy life, my dear."

What a boy he always was! Truly, those whom the gods love *die young*.

In 1913 Sir David gave his hearty support to the new observatory started by Sir Norman Lockyer, with valuable assistance from Mr. Frank McClean's sons,¹ at

"The work of Sir D. Gill's Committee, appointed in 1912 to consider the question of a Research into the Manufacture of Optical Glass, is now bearing fruit. The Treasury, on the motion of the Board of Trade, have promised grants of £1,500, £1,500 and £1,250 in this and the next two years; much of the necessary plant is at the [National Physical] Laboratory, and the experiments have commenced. The Laboratory has been in communication with the Institute of Chemistry with reference to this work."

¹ William McClean acted as Hon. Sec. on Sir Norman's committee, and his brother Frank presented his father's telescope and other instruments.

Sidmouth and, as Chairman of the Appeal Committee, obtained invaluable financial and scientific assistance for that observatory. He also assisted Sir Norman in the lay out and instrumental equipment of the observatory. The success of these efforts was ensured by the general support of astronomers, and by none more than M. Deslandres of Paris.

FROM SIR J. NORMAN LOCKYER

SALCOMBE REGIS, SIDMOUTH, *November 22, 1912.*

MY DEAR GILL,—It is very good of you taking all this trouble. You and Deslandres will end by making me conceited!

This subject was matter for a very long correspondence about the removal of the Solar Physics Observatory in the course of which Gill wrote on December 10, 1911—

TO SIR J. NORMAN LOCKYER

I feel that you and your work have been treated most unfairly—that the conclusion of the Committee is contrary to such evidence as has been collected—for I entirely concur in Glazebrooke's view of it. Evidence on a much broader basis and of a very much more conclusive character was required before the organization which you founded and have carried on so successfully for so many years was ruthlessly upset.

In the course of that letter, Gill's outlook upon controversies is illustrated by his suggesting a certain alteration of verbiage in a certain protest, "on the principle that you will catch more flies with sugar than with vinegar."

In 1913 Sir David Gill gave much help to the Maharaja of Jhalawar¹ in his plans for building an observatory in India.

34 DE VERE GARDENS, 1913, *May 23.*

MY DEAR MAHARAJ,—I am sending you, enclosed, a business letter about your proposed telescope and observatory.

¹ H. H. Raj Rana Sir Bhawani Singh.

My wife and I cannot sufficiently thank you for all your kindness to my nephew. He has written to us two long letters full of all his wonderful and delightful experiences and of your kindness and hospitality to him. I fear that you have been too kind to him and that his normal soldier life will appear very humdrum to him after all the excitement and fun he had with you.

I could not write you last week as I was away, as I told you I would be, on a visit to the Duke and Duchess of Northumberland at Albury Park—near Guildford. Sir Archibald Geikie was amongst the guests you know, and Lady Mary Meynell with her son and daughter (she is a sister of my old chief, the late Lord Crawford). I wish you had been able to be present at the Great Albert Hall meeting on the 21st, when Commander Evans gave an account of the Antarctic Expedition—with magnificent lantern slides. There was not a single vacant seat—over 10,000 people—all in full evening dress—present. I have just sent the last pages of my history of the Cape Observatory to press. In a month or two it should be published, when I will send you a copy.

There is no history of the Royal Astronomical Society. My wife's book, *Six Months in Ascension*, is out of print long ago—I am trying to find a copy for you in the second-hand book shops. I will write you further ere long. Meanwhile I hope to have your decision about the telescope. My wife desires to join with me in kindest remembrances. Yours most sincerely, DAVID GILL.

The year 1913 found the Gills once more at Llandrindod, and again they made their headquarters for the summer at Pitlochrie. From this centre he was able to pay visits as usual to his friends, when he shot grouse on their moors. He was also within easy reach of Blair Castle at Blair Athol where he was able to keep up his old friendship with the Tullibardines, and was again a welcome guest at the Duke of Athol's highland gathering. He also left Pitlochrie for a few days in September to attend the British Association meeting at Birmingham.

Here, also, he finished the index and completed his monumental work, the *History and Description of the Cape Observatory*, and was much relieved to get it off his

hands. It had cost him much labour during the years since he left the Cape. Much of the work upon it was done during the last three years of his life in the present writer's "Shed" at Pitlochrie, a kind of hermitage containing a good scientific library and other things of interest.

This splendid folio volume ¹ was almost the final act of his official life. On its last page might be written the words *Finis coronat opus*. It describes all the instruments added by him to the Cape Observatory and is a worthy successor to W. Struve's description of Pulkowa Observatory. It also contains a complete history of the Cape Observatory, and, most interesting of all, an actual autobiography of himself so far as his scientific work is concerned. It is for this reason that the present volume deals with his scientific work only in so far as parts of it serve to illustrate the character of the man. The printing of the *History, etc.*, was completed, and the book was circulated among his friends before his final illness. Subsequently, during and after that last illness, these friends uttered a pæan of thanksgiving that he had been able to leave behind him this imperishable memorial. Dr. Backlund of Pulkowa has beautifully spoken of the book as Gill's Swan Song.

Dr. Auwers, who died at the age of seventy-six, in 1915, one year after Sir David Gill, to the very day, January 24, wrote his last letter to him in November 1913, in a very cramped handwriting, to express appreciation of his book. There is something pathetic about the almost illegible letter.

FROM DR. AUWERS

BERLIN-LICHTERFELDE, 55 BELLEVUE STR,
1913, November 13.

MY DEAREST FRIEND,—Last week I received the copy of your *History and Description of the Cape Observatory*

¹ Published at H.M. Stationery Office. Price 25s.

announced some days before by your last letter, and I read at once a good deal of the history and turned over the drawings of the instruments erected since 1889 [1879?]-then the volume was laid aside for a time, to be more carefully read when my eyes are in a better condition than presently. In the now prevailing dark weather it is difficult for me to read any longer time, and artificial illumination makes things only worse. But I have read enough of the big book, to learn that it is full of interest, the more so to those who are acquainted with the Cape Observatory and its astronomers, and will prove useful for astronomers in general. You can be proud to have written that book, the largest part of which is a history and description of your own scientific life! Indeed, the words of Sir John Herschel, who in his obituary of Bessel so justly said of Bessel with regard to astronomy: "*Lateritiam invenit, marmoream reliquit*," will with the same right [be] applied by the history of our beloved science to you with regard to the Cape Observatory!

I thank you very much for the beautiful present you make me with the volume, and thank you most sincerely for the very kind and friendly terms in which you acknowledge my share in the common part of our astronomical work. You only should not, in connection with the observations of 1889, have spoken of self-sacrifice on my part which you feared would never be adequately repaid—the pains I took to assist you in an important undertaking were fully repaid at once during my sojourn at the Royal Observatory, by the profound strengthening of your most benefiting friendship and by the gain of your most excellent and truly adored wife's sympathy. These four months of 1889, indeed, were one of the most happy periods of my life—and there was nothing of self-sacrifice in connection with them!

Your letter of June last was like a blow on my head—I was quite ashamed to have forgotten your 70th birthday and can only so late afterwards express my satisfaction and joy that you have reached this term so full of health and activity. The reason why I always delayed to offer you afterwards congratulations has been, that I hoped this would be done in a more legible form than by these lines if I waited, but there seems to be no hope of recovery from the lameness of my arm which nearly prevents me

from writing (it is not from apoplexy as you might fear to infer from this statement, but age), the hand not following the orders given to it and making only microscopical motions, by which I compose these lines only with extreme difficulty, and fear you will find considerable difficulty to read them.

(*Cont^d* Nov. 16.) I forgot the approach of your 70th birthday under the impression that you were far more than five years behind me in age—an impression occasioned by the still continuous amount of your activity in life and science! Both of us have worked enormously, but you have taken the better part, in caring for a relief for mental exertion in out of door exercise, which I neglected too much, and besides, you are benefited with a happier temper which much contributes to keep you young.—In my feeling of shame on behalf of my forgetfulness I was a little comforted by remembering that once Lady Gill, too, forgot your birthday—in the preparation for Ascension!

The idea of the British knights of the order p.l.m. to congratulate the Emperor on his jubilee, was a very good one—certainly the Emperor will have been much pleased by this greeting.

I amused myself about your “skrupel” (I do not know the English word, “hesitation” is not quite the same) how properly to address me. My official title is “Wirklicher Geheimer Ober—Regierungsrath,” which means a Councillor of the first class (there are five classes), but this holds good only when I have to do with the Court and the Court-officials, otherwise I do not lay any stress upon titles and honours except those of a scientific character, and to my English friends I prefer to remain always the “Dr. Auwers” whom they knew so many years and to whom so many men on the other side of the channel, men still living and, alas, more men already gone have been kind throughout all this time. It is since 1866 that I was an Associate of your R.A.S.

I feel very sorry you could give only so unsatisfactory news of Lady Gill's health! She wrote me a welcome letter two months ago, and wanted to know our present lodgings—I address to her by this same mail, a post card bearing a photograph of it.

Always your sincere friend,

A. AUWERS.

Dr. Hale wrote from Pasadena, on December 6, 1913, a letter to Gill which he never saw. In it he says—

I have been reading your book on the Cape Observatory with the keenest interest, and wish to thank you very heartily for sending it. What a satisfaction it must be for you to look back upon so much work accomplished ! But your present activity bids fair to yield an equally important contribution to science. May your days be long in the land !

All scientific men felt that the publication of this book marked the closing record of a life continuously, selflessly and ungrudgingly devoted to the service of astronomy. There can now be no indiscretion in telling what was an open secret, that in 1913 Sir David Gill's name was before the Council of the Royal Society for the award of the Copley Medal, their highest means of recognition. Postponement for a year, which all present thought quite safe, was preferred for three reasons : the recent award to Sir David of a Royal Medal in 1903, Sir David's presence upon the Council, and the urgent claims of the actual recipient. His is not the only case (*e. g.* Poincaré) in late years where postponement has meant "too late." [Cf. p. 379, letter to Newcomb, on the award to him of the Copley Medal, dated January 14, 1891.]

This bald narrative of Gill's activities is now nearly concluded. It is partially supplemented by extracts from letters in the Appendix to some of Sir David's dearest friends. These, chosen as samples, convey far more the spirit of the man in work or pastime, and the ever-ready friendship. They recall the cordial handshake, the interested smile, the merry eye-twinkle and the sincere voice of the man who could count his enemies at any period of his life on the thumbs of one hand.

The seeds of Gill's last illness were probably laid at Sir Robert Ball's funeral. On December 6 he went to Cambridge, walking with Knobel and Dyson from the station in a thick greatcoat and getting overheated. He

then attended at King's College Chapel *without his overcoat*. It was a treacherous day, and after the ceremony he stood about the quad conversing with others. There can be no doubt that he thus caught a chill, just as Knobel did, and both were eventually laid up.

About this time he was several times out pheasant shooting, and at least on one occasion came home thoroughly drenched. He suffered a little from colds and had an attack of deafness. There was nothing to cause alarm.

On Friday, December 12, he attended the meeting of the Royal Astronomical Society, and handed over to the society the photograph of the moon which he had taken in 1868 and had presented to the late Sir William Huggins. On going home he again complained of deafness, saying that he had found difficulty in hearing what was said at the meeting.

On Saturday, December 13, he saw the doctor, who attended to his ears, after which he seemed to hear better, but in the evening he was dull and heavy.

On Sunday, the 14th, he took a short walk with Lady Gill in Kensington Gardens and the Park, but returned sooner than usual as he complained of being tired. He remained at home all afternoon, setting aside his invariable habit of attending the Sunday afternoon concerts in the Albert Hall.

He did not go out on Monday, December 15, but wrote a little for his Introduction to De Sitter's work on Jupiter's satellites. After dinner he had a slight shivering fit which might be due to influenza, but on Tuesday, the 16th, Sir Lauder Brunton pronounced it to be double pneumonia. Pleurisy followed, with much pain while it lasted. These symptoms disappeared, but the strain on the heart's action had been too great.

Then followed five weeks of perfect patience and calm on the part of the patient, of hopes and dreadful doubts on the part of all his friends, with days of ups and of

downs. At the January meeting of the Royal Astronomical Society the President, Major Hills, was able to say, "to-day there is a distinct improvement," and mingled with other marks of gladness, the audible sigh of satisfaction from the breasts of such an audience brought a lump to the throat.

Throughout the illness his weakness was so great that visitors could not see him. He had hardly the strength to speak. On the morning of January 24 he passed quietly away in the arms of his beloved wife.

* * * * *

The sorrow which fell upon his friends was profound, and the consternation with which the news was received by astronomers was almost incredible. He had been so vigorous to the end that his guidance in great co-operative works had been confidently expected to last, at least, for ten more years. At the time of the fatal announcement, after the long period of hope and dread, it seemed to his astronomical friends that the progress of astronomy had been suddenly stopped. In some of its greatest undertakings the two years that have followed seem almost to confirm this foreboding. The astronomical world hardly knew till that moment how much they were relying upon this man for their guidance in so many things. This has been the universal testimony of those who had worked with him.

During one of his last visits to Aberdeen, undertaken in connexion with a proposed Chair of Astronomy at that university, he had wandered with the Principal, Sir George Adam Smith, over the beautiful and ancient Old St. Machar Cathedral; and, struck by the solemn beauty of the site, he there and then purchased the site of a grave for his wife and himself, situated in a ruined part of the Cathedral.

On January 27 a small company of devoted friends accompanied the body to King's Cross station, and with it his widow, accompanied by a nurse and a few

relatives and friends, travelled to Aberdeen by the night express.

On January 28 a large and representative body of mourners assembled at the station, and subsequently joined the funeral cortège which proceeded to St. Machar Cathedral, in Old Aberdeen. The coffin was hidden by the wreaths, which numbered nearly one hundred, and included floral tributes and tokens from all parts of the world.

The interment took place outside the existing cathedral building in what was formerly the north aisle of the transept, close to the site of the great altar, an impressive service being conducted at the graveside by Canon Erskine Hill of St. Andrew's Episcopal Church, Aberdeen—the church in which Sir David Gill was baptised, in which he worshipped in his early days, and with which his people had been connected for many years.

The pall bearers were Mr. A. J. Mitchell Gill (brother); Mr. A. W. Mitchell (cousin); Principal George Adam Smith (representing the University of Aberdeen); the Right Hon. Robert Farquharson of Finzean, Vice-Lieutenant of the County of Aberdeen, representing Lord Aberdeen; Mr. Harvey Hall; Mr. William Black; Professor Niven; Mr. A. J. W. Storie; and Dr. Bruce.

The tenants on the estate of Blairythan were represented.

Floral tokens were sent by the observatories of the Cape, Greenwich, Paris, Pulkowa, Mount Wilson (U.S.A.) and other scientific bodies.

At the same time a memorial service was held at St. Mary Abbot, Kensington. It was conducted by Prebendary Pennefather, assisted by the Rev. C. Balmer, and was attended by a large number of the sorrowing friends who mourned his loss.

The following description of the grave was written by Lady Gill herself—

“My sacred ground lies in Old Machar Cathedral, within, and on the west side of, the half ruined wall of the

north transept built by Bishop Lychton in 1430. This part of the transept is known as St. John's Aisle, and when the ground was being made ready for my beloved dead, there was evidence to show that he lies near the foot of the high altar.

"This wall being under the control of 'The Commissioners for the Preservation of Scottish Ancient Buildings and Monuments,' I had to obtain their permission to remove the disfiguring whitewash in order to insert the mural tablet. On that being done, seven roughly dressed sandstones were discovered just over the centre of the ground, which, according to Mr. Kelly (an Aberdeen architect and antiquary), indicates that they formed part of a pier between two long narrow windows.

"The tablet, as well as the curbstone and corner blocks, is of grey Aberdeen granite and the connecting bars are of bronze. The grave is turfed over and no flowers are placed upon it, except when I am able to renew them daily—only the chaplet of laurel leaning against the old wall.

"David himself chose the ground in 1909, while we were staying at Aboyne near Aberdeen, during the summer of that year. He spoke enthusiastically to me afterwards of the sanctity of the site and the peaceful beauty of its surroundings, and so we decided to buy this ground for our burial.

"I never saw it until the 28th of last January, when we laid him to rest.

"I. S. G.

"*Nov. 14, '14.*"



[To face page 360.]

THE END.

APPENDICES

APPENDIX I

LIGHTER CORRESPONDENCE OF DAVID GILL

Letters to Miss Agnes Clerke, Professor Simon Newcomb,
Professor Kapteyn and Professor G. E. Hale.

SIR DAVID GILL was a voluminous correspondent during every part of his life. When Airy and Adams were gone there were no renowned astronomers left in England who could co-operate with him in his particular lines of research. His situation in the southern hemisphere detached him from insularity, and his astronomical correspondence acquired a cosmopolitan character. His long letters, commonly of fifteen or twenty pages, quarto, contained valuable discussions. Those dealing with the design and methods of using instruments of precision would form the basis of a valuable textbook. For the purpose of this book only a small selection of letters can be inserted, as examples of the spirit in which he maintained friendships with astronomers in all parts of the world.

LETTERS TO MISS AGNES CLERKE

A letter, dated November 7, 1888, gives her information about the progress of solar parallax observations on Iris by himself and Finlay.

CAPE OF GOOD HOPE, *November 14, 1888.*

MY DEAR MISS CLERKE,—Our week's work on Iris is as follows. [Details given.]

So you see only one day has been lost in the week. You really have run away from the fine weather. β Hydri is polished off, α Gruis and Fomalhaut are in hand in the evenings—the division errors drag their slow length along—the photographs go on—the bar comparisons—the meridian observations—the observation of occultations, the zenith telescope and the theodolite work, but I am too hard-pressed for eyesight to deal with star spectra. I must wait till Iris is over.

Grubb sends out his plan of the Dome which has been approved by the Admiralty. It is two feet bigger than I asked for!!!—They abused me for asking a 20 ft. observatory and wanted to make me adopt 18 feet. After a fight they agree to 20 feet, and now they want to give me 21 feet 10"!!!—But my foundations are laid for the 20 ft. observatory. . . .

More news next week.—Always y^r sincere friend,

DAVID GILL.

CAPE OF GOOD HOPE, *November 28, 1888.*

MY DEAR MISS CLERKE,—We were glad to hear that reasonably good arrangements had been made to convey you home—and that all were well on board—I only trust your good people at home were not much frightened. [It appears that Miss Clerke's ship had a collision with the *Tartar*(?). Here follow details of Iris observations.]

Last week we put on the micrometer again on the 7" Equ^l, and had a clean up there. Finlay and I roared with laughter on examining the floor—your track on the floor in search of the Declⁿ circle was marked by a perfect deluge of oil—what state are the dresses in in which you observed?—These spots shall be sacred as Rizzio's blood in Holyrood Palace. I can only send a few lines this mail.—Always sincerely y^{rs},

DAVID GILL.

CAPE OF GOOD HOPE, *December 12, 1888.*

MY DEAR MISS CLERKE,—We were so much delighted to get y^r letters from Madeira, and if we only learn by to-morrow's mail that y^r people at home were not anxious about you we shall feel quite content that you had a little adventure by the way.

I got a blowing up about my last letter to you—it did not go through the censor's office, and I am told on the best authority that had it been submitted to that ordeal it would certainly have been added to the Suppressed Correspondence. It was very unkind of me to put in anything about oil and the search for the Declⁿ circle—in fact I caught it—a Tartar—so did you by the way.

My little wife has not been well for the past fortnight—severe continuous headache. We are going off to Kalk Bay for a week's rest and change.

Iris has ended quite triumphantly—with good observations on Nov. 28, 29, 30, Dec. 2, 3, 4, 5, 6, 7, 8, 9, 10. On Nov. 10 [Dec. 10?] I recorded for the first time in my life Images 1 Steadiness 1—absolutely perfect definition—and at a zenith distance of 70°. So far Elkin has corresponding

observations on about half the total number of nights—but his last report only goes to Oct. 27. We have so many observations after Nov. 2 that we can almost make sure of utilizing any observations whatever that Elkin may get. In all we have 43 nights on which observations were secured—and to-night and to-morrow night are still before us.

Last night we had another Remenyi Concert—truly glorious—how I wish that you could have been here to hear him—he is coming out here this afternoon.

* * * * *

My wife sends her kind love—give my kindest regards to all y^r home circle.—Believe me always y^r sincere friend,

DAVID GILL.

CAPE OF GOOD HOPE, *January 16, 1889.*

MY DEAR MISS CLERKE,—I am afraid I am what our friend Major Morris would call a “baad booy.” Just after the Iris observations were over we went to Kalk Bay, and there I lay on the rocks and read trash for a week—and was much the better for the process.

We came back for Xmas. Sir Chas. Metcalfe dined with us in the middle of the day and told us all about his adventures in Bechuanaland when surveying the railway which I earnestly hope may be made. Boerdom and the Bond are of course against it. Then we all turned out on the lawn and played at rounders with the Finlay, Pett and Maclear youngsters till we were fairly done up. Then the world was filled with the excitement of a cricket week. Major Morris was quite mad for 8 or 10 days and did nothing but go and watch the English *v.* Cape matches—a dissipation which he has averaged by tremendous hard work ever since.

We have had since Dec. 28 the finest run of weather I have ever seen at the Cape—exquisite clear sky—no south easter and superb definition.

So the Heliometer has been very busy both evening and morning. I was just on the verge of knocking up when a couple of cloudy nights—last night and the preceding one—have given me rest.

So busy was I that I had almost overlooked my Report to the R. A. S. for the year—I wrote it last night—and it will be just in time. You will find y^r visit mentioned.

I hope y^r article will come out in the January N^o of the *Contemporary*. I much wish to see it. The *Observatory* letter reads well.

I am glad to hear you are so fairly in the way to mark, learn and inwardly digest all possible particulars of the

Herschels—are you going to Collingwood? You will like Sir William I think. I had much pleasure in making his acquaintance at Oxford in 1877.

Tell me about any news of y^r book in Germany. I don't think y^r music loving Dublin friend is wrong—an hour or two of Handel & Co. every day will brighten the Astronomy and do you good—to say nothing of the joy you can give to y^r astronomical and other friends. Believe me life is not too short nor the day too short for a little music every day—and when we come home in 1890 I hope to hear some results of y^r study.

Mouchez writes me again that the 1891 meeting will after all be *the important* one, but that one could not lose the opportunity of the exhibition to have a meeting in 1890. I do not see the connection myself—but I am not French. So we shall leave the exhibition to take care of itself but come to the meeting of 1891.

I think that Dr. Auwers will come in June for 3 months and take part in the observations of Victoria. It will be a great joy to me to have him here.

The chief observatory event is the arrival of a baby—the Father—Mr. Ray Woods—is beside himself with pride and joy. Before the arrival his chief thought was the *Durchmusterung*—Mr. Merriman who had been absent for a few weeks in the Transvaal had not heard of the new arrival, and on meeting Mr. Woods by chance enquired as usual after the “magnum opus,” expecting a detailed account of progress in the photography of the S. hemisphere.—Imagine his surprise when Woods gushingly replied, “Oh, very well indeed, thank you, such a fine fellow, and as like his mother as possible.”

η Argus is still brightening—quite $6\frac{1}{2}$ mag.—but I cannot yet make out a distinctive spectrum—colour reddish orange.

I wish one had more time and could go on for ever at work. But 3 sets of Heliometer obs. at night—and 3 sets of divⁿ errors by day are as much as my eyes can manage—and I cannot go skipping about the pleasant fields of miscellaneous observing till I have broken the back of my Heliometer work—However, y^r bequest η Argus shall be carefully looked to. . . .

* * * * *

Always sincerely yours,

DAVID GILL.

P.S. Poor Christie—last mails news of the death of his wife is very sad. I feel for him most sincerely—he was deeply attached to his wife and she to him—her loss will make a sad blank in his life.

CAPE OF GOOD HOPE, *March 9, 1889.*

MY DEAR MISS CLERKE,

* * * * *

I must plunge at once into the interesting matter of y^r Chap. XVII. You will find y^r MSS. (herewith returned) disfigured by pencil scribblings all along the margins—written in the delighted and at the same time critical attitude of first perusal. I think you will find them legible enough—but perhaps not very useful. On two or three points perhaps it is necessary to explain further. [Here follow valuable facts, chiefly historical, for Miss Clerke's sole use. Only one criticism, illustrating the man's mental attitude, is suitable for these pages, where he says :] I cannot bear metaphysical questions—such as so many of my countrymen love—but I confess to you that I do not like the airy way in which you make the assertion “since the stellar system is of finite dimensions.” If you adopt the theory that the star clusters form part of our sidereal system—and are not separate and more distant systems of which there may be an infinite variety and infinite number—if you mean by the stellar system all those bodies which we call stars—and which represent to our eyes the largest part of creation that we know—which indeed so far as our minds can grasp such a thing, are the whole embodiment of existent material matter, then you are by this statement placing a limit to the extent of existent matter which I find it as difficult to do as to limit the conceptions of infinite power and of an infinitely powerful creator. It is useless to pursue an argument on such a subject—you come at once to the unbreakable and insurmountable wall against which all the mental philosophers and metaphysicians have been beating their heads since the days of Plato without making the slightest impression against that obstacle—the boundary wall of the little hollow sphere which limits the mental conceptions of man, and which by death he alone can pass to the freedom of the space beyond—to the wider knowledge of God and his creatures.

If you say, “Provided that the stellar system is of finite dimensions” then so and so—you are then in a strictly logical satisfactory position.

[The letter proceeds to describe and discuss the plan which Professor Kapteyn had just sent him for obtaining stellar parallaxes accurately and in shoals by exposing the same photographic plate at two intervals of six months. He also describes a plan privately put forth by Pickering for producing a photographic chart of the whole heavens in both hemispheres, with a single specially designed telescope, in a few

years. He says : " As a mere map making plan this is infinitely superior to the Paris plan, and will cost in the end far less."]

I am glad to have some explanation of the non-appearance of y^r note in the Feb^y number of the *Observatory*. There are few reasons I could excuse more readily than the distraction produced by golf.

There is no star on y^r list marked r Velorum. There is a star r Argus $10^h 17^m 30^s$, $-41^\circ 5' 29''$, mag. 5.3, N^o 31a of y^r list. Y^r only note is "observed Oct. 10 when spectrum seemed continuous." I will look the matter up after publication of y^r note in March number.

What a most wonderful photograph that is of Roberts of the Andromeda nebula—a nebular Saturn?—with all manner of subsidiary vortices in the rings. It must influence your views on the nature of nebulæ.

I should say most decidedly stick to Dreyer's Catalogue, and its numbers, it is practically complete—certainly so for your purposes.

I cannot write more this mail. I can only thank you for the great pleasure that the reading of this chapter has given me, and I should very much like to see others.

My chief news is that Dr. Auwers is to sail for the Cape on May 3 to pay us a visit—that is a great joy.

The survey reductions are finished and Morris left yesterday for Port Elizabeth to resume field work.

The Transvaal is beginning the geodetic survey which I planned for them. I have its scientific direction, and one of their surveyors came down a week ago to remain a few months and practise astronomical observations of Latitude, Longitude and Azimuth. I have long worked for this and am happy in its realization and think that in course of a few years we shall be able to show important geodetic results.

My little wife is fairly well—a little return of the old suffering. She joins me in all kind messages to you and yours.

Believe me always y^r sincere friend, DAVID GILL.

Where did you pick up such a "sporting" phrase as "Swiftness may be safely *backed* against conspicuous lustre" (p. 18). Was it in the Bohemia of the observatory or in the racing society of Government House? !!!

CAPE OF GOOD HOPE, March 15, 1889.

MY DEAR MISS CLERKE,—Your letter of 14th Feb^y has just arrived, and the Chapter on Star Distances was sent

off by last mail—with numerous notes thereon. Elkin will certainly work further on α Lyræ—but his results are unquestionably far more trustworthy than any previous determinations of the parallax of that star—although I confess to you that it is almost impossible to overturn Brunnov's evidence—the first paper of the Dunsink Series. And yet we have in a second paper of the same Series, on further measures of α Lyræ, a confession and a proof of change of habit in bisecting the brighter star. That is really the root and the foundation of the Heliometer method—you perfectly equalize the brightness of the two images under measurement—whatever change of habit of bisection may occur it affects equally both stars and the two opposite pairs of stars, and its effect on the parallax entirely disappears.

With bright stars the chromatic dispersion of the atmosphere produces probably a different displacement of the point bisected than it does in case of faint stars—and there are other curious sources of error when stars of dissimilar brightness are compared. Then again, as I pointed out in my marginal notes, there is proof in Elkin's work alone of considerable possibilities of variation in the absolute parallax of the comparison stars.

The details of Elkin's work are not yet published—but I should say on the whole it must be and is most thoroughly sound. But we can only talk of absolute parallaxes now when we have determined parallaxes relative to a number of comparison stars and have some sound notion of the average parallax of such comparison stars.

The review of yr book in the *National Zeitung* is evidently a species of German Jingo production, and yr sister's guess as to the origin of the inspiration of it may be nearer the truth than she supposed when she made her joke. It is rabid nonsense to say that the German Transit of Venus results will be peculiarly triumphant, as I happen to know more intimately than most people do Dr. Auwers, the organizer of the whole work and the Editor and reducer of the results. His view is that the chief value of the expedition was the determination of the geographical positions of many places not well known before, the impulse to invent new methods of astronomy and new instruments which was the indirect result of turning many minds to one subject. The resulting parallax will be an approximation to the truth but by no means a definitive settlement of the question. This is Auwers' idea and he knows more about the matter than any one else at present and certainly a great deal—ininitely more—than yr reviewer. More than that, he is coming out here himself to share in the work of the Victoria Observations in June,

July and August, because *with you he believes that the Helio-meter-Minor-Planet-method is the right one.*

* * * * *

I don't see that you could depart very far from the historical style in the star distance chapter. You cannot evolve stellar parallaxes from y^r inner consciousness—and you must be peculiarly careful about facts.

I want to see the other chapters as soon as you can let me have them. I write at once and in haste—for many things press.—Always Sincerely Y^{rs},
DAVID GILL.

[P.S.] There are some good notes on Stellar parallax in the *Sidereal Messenger* for Feb^y by Monch (p. 62).

I have just got a formal letter from Tacchini with a Diploma intimating my election as a corresponding member of the Italian Spectroscopic Society. It must be a sort of token of favours spectroscopic to come from me for I don't think I have done much as yet to promote spectroscopy. I had perhaps some claim to the Acad. Linc. Rome, but none to the Spec^c Society. D. G.

FRENCH HOEK, April 7, 1889.

MY DEAR MISS CLERKE,—We came here 8 days ago for a little holiday after the summer heat. Since the beginning of the year my little wife has been suffering from the old trouble and pain which she had before you came to the Cape. Only on this occasion the suffering has been more continuous and more severe.

* * * * *

I have had a terribly busy time. One by one my computers have been going off to the gold fields—and I have had to write to the Admiralty to send some out from England, as no suitable young men can be found at the Cape. Thus I am not able to write you as much as I would wish to do.

But now to resume the thread of our correspondence. [Further considerations *re* parallax of stars, and particularly of Groombridge, 1830.]

The *Contemporary* article arrived on the eve of our leaving for this place, and I read it in the train. I have since re-read it carefully. . . .

The paper reads delightfully in print. All papers do read so much better in print than in MSS.—and you know how much I liked it in the latter form. You are really most eloquent on the flowers, and almost equally so on the southern stars. I should have thought it w^d have been the other way—but then you use such a delightfully astronomical and at the same time absolutely perfect expression “a Milky Way of

lilies"—that I don't know whether the flowers owe most to the stars or the stars to the flowers.

* * * * *

I look forward to reading Ball's article in *Macmillan*—such articles as that are very helpful—they accustom the public mind and the minds of those who hold the purse strings to the needs of astronomy.

I do not think you have seen the Orion Nebula with the naked eye. You have seen, as I see, a rather ill defined looking star—which looks as if it were several stars together—too close for definite separation by the naked eye—but I do not think that any one could say, who did not know that there was a nebula there—that is either a nebula or a star cluster.

Now you can say that of the Andromeda Nebula and of many star clusters like Presepe in Cancer—but I do not think any one could say so of the Orion Nebula. I certainly cannot say that I see more than the possibility of a few fairly bright stars near each other, and my eyes are as good as those of most people.

I was delighted to see that Mr. Roberts¹ had presented Ball with a Reflector. Ball will use it well—and he will probably develope accurate measurement by photography. He has a very fine mechanical genius and will plan his work well. He is getting a little past the time of life when men like much getting up in the early morning at the uncomfortable hours which rigid parallax observations require, when all possible personal errors have to be investigated—but he will get a photographic assistant to do that for him, and will look to the measurements and their planning and discussion himself.

* * * * *

I am delighted to hear that Common has got an assistant. Such an instrument as his deserves to be worked at every opportunity—and a busy man like Common cannot do that.

I am delighted to hear that the giant glass discs are cast for the Californian 5 foot refractor [*sic*]. I hardly agree with you that 3 foot is the limit of useful size. . . .

I hope they will go in for a better mounting. I warned Newcomb of the error of the American tendency. The Lick mounting is unquestionably too light—How I should like to plan a mounting for the 5 foot. It will be a great pity if this 5 ft. is not in some way available for photography.

* * * * *

Many thanks for the references to Ball's, Holden's and Sir C. Metcalfe's papers in various magazines. I shall read all

¹ [Isaac Roberts.]

with much interest, and I shall always be very grateful for similar references in future.

* * * * *

Always Sincerely Y^{rs},

DAVID GILL.

CAPE OF GOOD HOPE, July 1, 1889.

MY DEAR MISS CLERKE,—I have allowed several mails to pass without telling you that y^r two Chapters arrived safely.

Auwers and I have gone over one, and I hope before next mail that we shall be able to go over the other also—and I hope to have time to send you a letter about them. I only write now a few lines of apology. I am so busy.

Most of my computers are off to the gold fields—even Mr. Freeman is gone, and having cabled for more from England the Admiralty want a report—which I am now writing.

Natal wants a decision from me about her share of the survey—and this is the time for preparing estimates for next financial year—and the new Photographic Dome is being put up—and the Victoria Observations, and arrangements for telegraphic longitudes on the W. Coast of Africa—Capt. Pullen as travelling observer,—All was just ready, his personal equation determined, and he was to sail in H.M.S. *Peacock*—and behold to-day that ship is ordered off to Delagoa Bay with H.M.S. *Bramble* also to look after British *v.* Portuguese interests there. So new plans have to be made.

So I am in a *snarl* of work, and you will I hope excuse these hurried lines from y^r Sincere friend, DAVID GILL.

P.S.—16 sets of parallax obs. of Victoria up to date. Please mark, learn and inwardly digest Vogel's recent paper in the *Astron. Nach.* on his photographic determination, by means of his new spectroscope, of stellar motions in the line of sight. Contrast, for example, his results for the motion of Capella with those at Greenwich. See how perfectly the results are brought into perfect accord when corrected for the motion of the Earth. One almost looks for the time when the velocity of the Earth's motion (*i. e.* the $\odot^r$ parallax) may be determined in this way. I think it is the most important advance in practical astronomy made at one step for many a long day. His results in accuracy are to those of Greenwich as the accuracy of Bradley to that of Ptolemy.

My wife has been very well indeed since return from French Hoek till a couple of days ago when pain returned.

CAPE OF GOOD HOPE, September 11, 1889.

MY DEAR MISS CLERKE,—I am quite ashamed of myself but Auwers and Victoria together have been too much for me—

all my time has been so closely occupied. But we have got a very splendid set of observations over 3100 pointings on 51 evenings and 48 mornings—and these alone without the work of any other observatory would give not a bad value of the $\odot^r$ parallax. But combined with the Yale, Leipzig, Gottingen and Bamberg (?) observations should make a tremendously exact determination. Hartwig of Bamberg I hear was married just a week or two before the Victoria observations began—and I have not heard from him yet whether he has made any observations of Victoria or not—but I fear not. Elkin and Hall have of course done a lot of work and their reports are favourable up to the date they go. Leipzig and Gottingen, valuable but less numerous than Yale.

By next mail *without fail* your chapters will return to you.

* * * * *

My dear Friend Auwers is off—he left us last week—my wife was in tears at his going—Auwers and I had a little holiday together.

* * * * *

My wife is so well—and has so been for the last four months. I am in despair about computers—all going off to the gold fields—I fear Sawerthal will go too.

* * * * *

Ever yr Sincere friend,

DAVID GILL.

CAPE OF GOOD HOPE, September 18, 1889.

MY DEAR MISS CLERKE,—At last I send off the Chaps. XVIII and XIX, and the more I read them the more I like them. There are only a few points about which I have made notes on the margin—so few that I am ashamed to have kept them so long for so little.

But Auwers and Victoria kept me very busy, and then we took a little holiday together to Ceres, Wellington and Cape Point, and this created arrears to be made up—and so . . .

Please forgive—and let us pass on.

Holden is attempting too many different things with the Lick telescope—and after what Vogel has done he should go straight into stellar spectra and stellar motion in line of sight by photographs. You must dwell on this more in Chap. XIX. Contrast the results with the two methods—not the mean but the individual results—and show the enormous advance that has been made.

I heard, probably through the same Oxford channel as y^rself, of the Huggins difficulties, and I was delighted to hear that steps were being taken to secure a Queen's pension—no one ever better deserved it.

Yes, Pickering is the fellow to pick up money—and he uses it well when he gets it.

I deplore the tone of the *Observatory* article on the subject. . . . His star pictures will be much more complete and convenient (for they will contain 25 square degrees each) than those of the Congress which contain only 4 square degrees—but his work will be far less accurate and incomparably inferior in importance to the Catalogue. The two works are both desirable and should both be carried out.

As I said before—you have tumbled into a common error about Argelander's *Durchmusterung*. It is only exact, and only pretends to be exact to 9th Mag. Anything below 9·2 or 9·3 was put down as 9–10 and printed 9·5, but really a vast number of 10 mag. stars were thus catalogued.

I sent you a report of a lecture which I gave the other day in Cape Town—a hash of the R¹ Institution lecture and the nebular hypothesis—but the people seemed delighted with it—and in articles about it they said the Queen of Sheba (that's you) had come from the North (instead of the South) to hear the wisdom of Solomon (that's me !)—and much other Editorial froth.

Did I tell you that Victoria was a great success. Auwers and I got 3100 pointings on the planet. Sappho begins to-night—and I have to do both the evening and the morning observ^{as} for Mr. Finlay is engaged in exchanging signals with Captain Pullen every night—who is travelling along the W. coast with a gunboat and determining the longitudes at all points where the cable lands.

* * * * *

My little wife is so well. She liked Auwers as much as I do. He is such a splendid fellow—so staunch and true—so absolutely reliable.—Her absolutely good health during Auwers' stay dispelled the only cloud that ever happens in our home life—anxiety—and so we had a very good time.

She joins me in all kind messages to you and yours.

Ever Sincerely Y^{rs},

DAVID GILL.

A letter dated February 26, 1890, from the Cape of Good Hope is very interesting, but rather too controversial for these pages. Regarding the *Astrographic Catalogue* he is glad to be able to say: "I think the Catalogue question begins to settle itself." He reviews the course that had been followed by the Astronomer Royal's chief assistant, regretting it for his sake, crediting him with a right spirit, and attributing his hostility to that great undertaking to the unfortunate influence upon him of men he is associated with.

Regarding Mr. Christie's advice to the Admiralty not to pay for the work of comparing the heliometer observations of minor planets in the northern hemisphere with those at the Cape, for determining finally the value of the solar parallax—one of the two objects for which the Admiralty had installed the heliometer at the Cape—Gill speaks in pretty strong terms, saying: "I need hardly tell you that I do not intend to accept such a refusal."

A letter dated May 6, 1890, after the death of Miss Clerke's mother, deals with personal matters concerning which his advice was asked.

CAPE OF GOOD HOPE, 1890, *July 8.*

MY DEAR FRIEND,—I will write to you definitely about β Orionis next week, but the fact seems to be this that β Orionis and one of the comparison stars are at a very great distance beyond the other comparison star. . . .

I am very proud about my Berlin Acad.

The only English Members are Prof. Cayley, E. Frankland, Sir J. Hooker, Huxley, Salmon (Dublin), Sylvester, Sir W. Thomson, Sir G. G. Stokes, Prof. Williamson (For. Sec. R.S.), and Airy and Sir R. Owen who are Foreign Members, and Earl Crawford Hon. Mem.

The list of astronomers in the Acad. is Auwers, Airy, Cayley, Gould, Krueger, Newcomb, Schiaparelli, Schönfeld, Struve, Winnecke.—Y^{rs} sincerely,

DAVID GILL.

The letters to Miss Clerke were for the first time interrupted by the visit to England in 1890. Those of later date can be quoted here only in parts. Yet, if there were space, they would be equally valuable, if the object of this book were only to tell of the assistance he gave to others, the work of the Cape Observatory, the opposition encountered, the successes gained, the approval of those whose opinion he valued, and the honours showered upon him by learned societies in all the great countries of the world.

A letter dated July 22, 1894, discloses an intrigue against him worked through the Treasury, and detected by the Admiralty. Dr. Gill tells Miss Clerke all this with full details, because "it is an item in the History of Astronomy." It is an example, he says, of what he has had to encounter for twelve years.

1889 [1899?]. *Feb.* 13. We are all rejoicing in the award of the R.A.S. Medal to Mr. McClean, and the whole staff assembled on Friday in the Dining Room and drank his health with all the honours—cheering till the old place shook again. . . . Rhodes has promised me that . . . he will place at my disposal the fund necessary to carry the arc of meridian to Lake Tanganyika. I devoutly hope all will go well—if so I may yet live to see that arc carried to Cairo—perhaps even connected with Struve's arc to the North Cape.

1902. I have been away in the Transvaal on a visit to Lord Milner at Johannesburg. I need hardly tell you I enjoyed it—for there is no man whose society I enjoy more—tho' he is such an overwrought man that one can only get scraps of it. He is at work by 7 o'clock. A hasty breakfast and work on to 1.30 in his office at Sunnyside. At 2.30 he starts for his walk ($1\frac{1}{2}$ miles for exercise) to Johannesburg whence he seldom returns till 7.30—and at 10.30 he usually goes to work again till the small hours of the morning. . . . The labour question is very pressing—they have not half the native labour they require. Rents are exorbitant. "You see that place over the bootshop—that's my office, and I pay a rent for which I might hire Buckingham Palace," said Lord Milner.

1903. *Feb.* 18. [Extolling her new book, *Problems in Astrophysics*.] So happy, so strong and so useful a book. . . . I do not believe that there is a man living who knew beforehand all the facts that you have brought together, and brought together so well in their proper places.

1903. *December* 2. Many thanks for your kind congratulations on the Royal Medal Award.

We were at Caledon at the time—Mr Franklin-Adams and I were chatting after lunch. Bella had gone to her room but presently returned with a flushed excited face—and eyes beaming with joy—"Guess what I have got here," showing a telegram. Of course we could not guess, so then she read the cable message which had been received at the Observatory and forwarded by Mr. Hough. It conveyed congratulations on the Medal by Huggins, Wharton, Turner, McClean and Christie. I remember nothing that has given her greater pleasure.

* * * * *

I am busy erecting the new sidereal clock. It is, or I believe will be, the most important step in instrumental Astronomy.¹ It has cost first and last about £1000, and I expect

¹ [In support of this belief, see p. 244, foot-note.]

the phials of the Admiralty wrath poured upon me for this excess of estimated expenditure.

Still, as I hope for nearly perfect results I think I shall be able to face the storm. It took 24 mules to drag the wagons conveying its various parts from the Docks to the Observatory—so it is a more elaborate affair than the ordinary observatory clock. It has a whole house to itself.

1904. *November 16.* [This letter tells of his deep grief on the death of Mr Frank McClean.] I have also lost another very dear friend Mr John F. White of Aberdeen. . . . He was one of the sweetest and best of men, and most highly cultured. . . . Now his gentle spirit is at rest.

Miss Clerke died in 1907, after Gill's final departure from the Cape.

The very great esteem in which Sir David Gill held Miss Agnes Clerke was shared by many, among others by his fellow-worker Newcomb. Writing to Gill from Washington March 5, 1907, he says—

I was much grieved to hear of Miss Clerke's death following so closely on that of her sister. In past years one of the pleasantest features of my visits to London was my warm and almost affectionate reception by my lady friends at 67 Redcliffe Square; but it was only recently that I came to know how interesting was the scholarship of the two Misses Clerke. Now they have gone, leaving the brother alone so far as I know. If you meet him I wish you would tell him of my sentiments.

LETTERS TO NEWCOMB

In the whole history of astronomy, far more than of the experimental sciences, the men who secure the facts and those who deduce the resulting theory have been different men. The theorist is absolutely dependent upon the observer for his data; and the observer who desires to use his power in the best way must consider the needs of the mathematical theorist.

So Ptolemy was dependent upon Hipparchus, Kepler upon Tycho Brahe, Newton upon Flamsteed, and Newcomb upon Gill. The last of these could obtain, from the great observatories, data computed with the finest superintendence from routine observations made by paid assistants. But when he wanted the utmost accuracy obtainable for his lunar and

planetary calculations he relied largely upon Gill. The distance of the sun, the mass of the moon and Jupiter, the constant of aberration, the accurate positions of the moon by occultation and of major planets by heliometer, and, still more difficult, of the sun, were some of the data discussed in correspondence, and secured by Gill for Newcomb to use in his tables.

Sir Isaac Newton would have done more for astronomy had he and Flamsteed (the Astronomer Royal), who were ever in antagonism, been united by the affectionate esteem which prevailed between Newcomb and Gill. The gaiety of Gill's disposition is continually shown in his correspondence with real astronomers, whose greatest happiness lies in loving their science, and in making supreme efforts to do their duty by it. Unflinching opponents of humbug like Simon Newcomb were the men to whom Gill was most ready to show his inner self, in work and in play. The following extracts from letters to Newcomb could be written only between friends who each thoroughly knew and appreciated the other's mind.

1889. *May 6.* . . . At this moment I believe Auwers is somewhere between the Bay of Biscay and Madeira, on his way to the Cape. I wish that you were with him—what a rare time we should have together. . . . When they [the Sappho observations] are over I shall have surely earned my proposed holiday in 1890. There is the definitive meeting of the permanent committee of the Astrographic Congress which I *must* attend—but I also want some fun—for I have been close at work for 10 years now. According to this we are both intent on kicking our heels and having a roll on the grass about the same time.

1889. *3 July.* I am happy to tell you that on the morning of 28th June we had glorious weather and Auwers and I measured y^r Eclipse for you, I hope more completely than ever an eclipse has been measured before. . . .

Auwers is a charming guest—a man I have known well and esteemed among my best friends since I came to know him in 1873. But the more I see him the more I know and love him—and am only beginning to realize what a truly splendid fellow he is. I would that you were here.

1889. *October 7.* . . . My good friend Auwers is gone, and I am left alone with Sappho. . . . And so the fair Barbarian ¹

¹ Professor Newcomb's daughter. See p. 149.

is a mother—and all goes well—God bless her. . . . Auwers is a devoted admirer of the F. B. so I long even more than formerly to meet her face to face.

1890. *Jan. 21.* [After criticizing Newcomb's published judgment, and stating his own, about Transits of Venus and Solar Parallax.] Now my good friend—there I am—do you go for me—You have my thesis—or at least I have I think sufficiently attacked yours to set the ball a rolling.

Let's first shake hands before we box
Then give each other friendly knocks
With all the love and kindness of a brother.

1891. *Jan. 14.* MY DEAR NEWCOMB,—First of all my most warm and sincere congratulations on the honour which our Royal Society has done itself, by conferring on you the highest scientific distinction which it is in the power of scientific England to bestow. The Copley Medal is fortunately one of those distinctions which have been preserved worthy and pure by an honourable body of competent judgment, and desirous to honour only those who are worthy of honour. It is a prize which one may hand down to one's children with pardonable pride—an heirloom that they will cherish reverently if they are worthy children of their worthy Father.

1892. *May 14.* . . . Did I tell you, they asked me to go to Cambridge—but I felt that my proper work is here. . . . You are a heavy task master however for I am toiling away observing every evening and early morning to try to get you a reliable value of the Aberration Constant.

1894. *May 30.* . . . I have, I think, only one enemy in the world; but he has been giving me a lot of trouble. Having failed to make more mischief at the Admiralty, he got at the Treasury. . . . You can therefore imagine what a boon your letter acknowledging the Victoria and Sappho work was. I sent a copy to the Lords Commissioners of the Admiralty who I think will be glad to have it as a weapon to use in the fight with the Treasury.

TO THE SECRETARY OF THE ADMIRALTY

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1894, *May 23.*

SIR,—In my letter of 1894, March 21, I had the honour to report the value of the Solar Parallax and of the Mass of the Moon (resulting from the observations of Victoria and Sappho) for use in the Nautical Almanac.

At the same time I forwarded these results, with further details, to Professor Newcomb, and I have now the honour to transmit a copy of his reply in the hope that my Lords Commissioners of the Admiralty may be pleased to know the estimation in which these results are held by the chief living authority on such subjects. In connection with this latter remark I should perhaps explain that Prof. Simon Newcomb is now bringing to completion the work on which, with the aid of a large staff of able mathematicians, he has been engaged for the past 15 years. That work embraces a complete theory of the motions of the members of the Solar System, a re-discussion of all the existing observations of these bodies, and new tables of their motions.

Thus Newcomb's Tables will supersede all others in point of accuracy and must be adopted for use during the next 50 years at least, in our own Nautical Almanac as well as in all other Nautical Ephemerides.

My Lords Commissioners of the Admiralty will thus be in a position to estimate the value of the service performed at the Cape Observatory in a matter so intimately connected with the purposes for which the Observatories at Greenwich and the Cape were founded and are maintained,

I am, etc.,

DAVID GILL.

Further papers on the same subject are forwarded to the Hydrographer.

NEWCOMB TO GILL

NAUTICAL ALMANAC OFFICE, NAVAL OBSERVATORY,
GEORGETOWN HEIGHTS, D.C., *April 23, 1894.*

MY DEAR DR. GILL,—I have received the definitive results for the solar parallax, as derived from the observations of Victoria and Sappho, enclosed in your letter of Mar. 21st.

I must congratulate you on the unequalled precision reached by these observations. That the system which you have devised may be applied to determining the positions of the planets with a precision heretofore unthought of, has recently been pointed out in a number of the *Astronomical Journal* which I am glad to know you have seen.

The observations which can be used in forming the new tables of the four inner planets being now closed up, I beg leave to express my personal and official appreciation of the observations and results which the Cape Observatory has contributed to the work in question. I find that out of 1,036 observations of Mercury, made during the years 1884 to 1892, inclusive, no less than 532, or a little more than one-half, were made at the Cape of Good Hope. Of course, such a result was possible only through your fine climate and favourable

geographical situation; but these circumstances would not have sufficed without the ardor of the astronomer. In my last annual report I expressed my official indebtedness to you, and I hope that in my next one the substantial completion of the work on which I have been officially engaged for more than fifteen years will afford an occasion for a more complete statement of the indebtedness of the American Nautical Almanac Office to Her Majesty's observer at the Cape, for observations and results of the greatest value,

Yours very sincerely,

SIMON NEWCOMB.

FROM THE SECRETARY TO THE ADMIRALTY TO DR. GILL

ADMIRALTY, S.W., *June 30, 1894.*

SIR,—In acknowledging the receipt of your letter of 23rd of May I am commanded by My Lords Commissioners of the Admiralty to convey to you an expression of their satisfaction at the valuable results of your labours which have been of much use in compiling the Nautical Almanac and have tended greatly to the advancement of gravitational astronomy.

I am, sir, your obed^t servant,

EVAN MACGREGOR.

1894. *July 17.* I am delighted to hear that action is being taken to put a real astronomer at the head of the new Naval Observatory at Washington—a man responsible for the work of the Establishment.

The thing that has bothered me is why, when they have got a man like you in America, they don't put you at the head of its astronomy. The absolute power put in the hands of a Naval Officer as Superintendent is quite ridiculous.

I thought he was a pleasant sort of gentleman who signed receipts for books and many papers and so on—who smoked cigarettes with visitors to the Observatory and otherwise did the ornamental duties of the office, and wore a uniform occasionally as a figure head. But as the only adviser—that is absurd indeed! There is only one way to put matters straight—and that is to put the Astronomers in command of the American fleet. I think you and I would make quite as good a job of the command of a fleet as the Admirals would of the real command of an observatory—perhaps better. I shall be anxious to hear the result.

Both Gill's work and Newcomb's came in for closely reasoned arguments on both sides, each anxious only to have the point at issue thoroughly threshed out, and the truth established. They certainly "gave each other friendly knocks with all the love and kindness of a brother." The

very phraseology indicates this spirit, as when Gill answers a letter thus—

1895. *Dec. 17.* . . . But there is a still more curious fact, viz. that there is a celebrated and phenomenally active astronomer in America [Newcomb], who having put all the Solar System in order is now engaged in drilling the stars—and bringing all our practical work into a systematic whole.

But this good gentleman is so busy that it is quite impossible for him to find time to read the introductions to works which he utilizes—but he finds time to find out faults in them, and to make surprising discoveries all of which are contained in the introductions to the works in question.

I believe you know this gentleman, and I would ask you to do what I have not the courage to do, to play the part of the candid friend—and put him right—and do impress on him how desirable it is to read the introductions.

The fact is that Newcomb had committed the blunder of assuming that Gill's catalogue for epoch 1885.0 included corrections for proper motion, though the introduction distinctly states the contrary. Thus he found a difference between Gill's Declination of Arcturus (mean epoch of observation 1882.12) and Boss' amounting to 3" due, of course, to proper motion.

1895. *Dec. 31.* MY DEAR NEWCOMB,—Y^r letters are never a nuisance, always a delight. A Happy New Year to you and many of them (new years and letters too).

Gill's correspondence with Newcomb from 1895 onwards is mostly technical, relating to Newcomb's fundamental work.

1897. *Dec. 26.* MY DEAR NEWCOMB,—The matter of our correspondence seems to have fallen into the condition of affairs so graphically described by the Governor of North Carolina in his opening remarks to the Governor of South Carolina. I would hope the matter is going to right itself. We have both been abnormally busy. . . .

I am thankful to tell you that Mrs. Gill is much better—this is her birthday, and a very happy one it has been.

She joins me in all good wishes of the season to you and y^{rs}. May the new year be a happy one for you, and may your great work prosper in it. . . .

P.S. Y^r letter of Nov. 29 . . . just come in as mail goes. . . . So glad to see y^r writing again.

1898. *March 24.* MY DEAR NEWCOMB,—I also am at a loss to understand the howl of your compatriots against the Paris Conference resolutions A—, with B—and C—yelping behind like poodle dogs in the rear of the pack. The one point about which there is a show of reason is the Aberration constant. . . .

I didn't expect many people to go to the bottom of the [solar] parallax volumes—but of the few I did think you would be one. I wish you could find time to devote two or three evenings to them, and then write me as sharp a criticism of them as you can.

The new McClean telescope sailed a week ago from Liverpool. We are off to-morrow to the hills for 10 days or so, returning in time to meet the new baby on its arrival.

1898. *May 3.* The mail just arrived brings a splendid-looking document—to certify that I have been elected an hon^y member of the New York Academy of Sciences. . . . It offers another inducement for me to visit America—were it possible to find one to mention beside y^r long and often repeated invitations.

If I can, I must and will come to America in 1900—not for the eclipse so much as to see you all.

1898. *June 15.* I have just received a letter from Professor Agassiz informing me of my election as a Foreign Member of the National Academy of Sciences, Washington. . . . I do not conceal from myself the fact that your partiality has had more to do with this election than any work that I have done. . . . I hope you will mention to those astronomers who are Members of the Academy how deeply I feel this mark of their esteem, friendship and good will.

1898. *Sept. 19.* . . . I have some young men now who are doing active Heliometer work. My eyes are not so good as they used to be. . . . I don't think I told you about it [his new Transit Circle]. It is somewhat a new departure. The whole stand is iron—so are the cube, tubes, etc.—the micrometer boxes are cast iron, the slides and screws steel.

The pillars are hollow cast iron and filled with water—to ensure layers of equal temperature. They are covered with thick non-conducting material and covered outside with polished copper.

The circles are solid cast iron discs, divisions on iridio-platinum—and are surrounded with double screens of copper with air-space. These covers attached to the pier. The turned cast iron tubes are also surrounded with double copper shields with air spaces [these shields attached only to the

cube], to ensure equal distribution of temperature. [Sketches show how the Observatory rolls back in halves, leaving a 6 ft. opening on the meridian.]

The instrument is, of course, reversible, and has meridian marks N and S in the focus of lenses of 300 ft. focal length.

1899. *Jan.* 28. We had the great pleasure of seeing Prof. Agassiz here the other day at lunch. . . . So glad you are pleased with the C.P.D. Kapteyn is a grand fellow and a grand worker.

1899. *April* 13. Next week I am going up to Rhodesia for a month to start the reconnaissance and beaconing, along the 30th meridian. . . . McClean is quite right about oxygen in the spectra of β Crucis, β Centauri, β Can. Maj. and we find it in ϵ Orionis. We are getting fine results for motion in line of sight.

1899. *August* 23. It would gratify me to see a total eclipse before I die—and I should *enjoy* it—but I don't think I sh^d *work* at it. . . . I am so glad you are going to see Kapteyn. Unless I am very much mistaken you will find him a man after your own heart. He is not only a very accomplished man of high aims and indomitable pluck, but he has a very fine character, and is a most sterling good fellow. . . .

My dear wife has been ill again. Mrs. Cunliffe [the late Lord Herschell's sister] who had been like a mother and sister to her for 20 years—who nursed her during a great part of our last visit to England—and who for 20 years, when she was not with us, never missed a mail in writing—died suddenly at Oxford.

You will find Kapteyn very happy in the completion of the *Durchmusterung*. I am quite ashamed to find my name on the title page of a work with his, for my share in it is so small compared with his. . . . I do not believe that ever was so big a piece of work published with so few errors.

1900. *Jan.* 18.—The war keeps us in a terrible state of nerve-tension, so that it requires a great effort to keep one's mind fixed on ordinary work. Like every third man one meets I am an amateur General—can't help it. . . . We have a cavalry and horse artillery camp just under the Observatory windows, and many an old friend I have seen there on the way to the front—some of whom I shall, alas, never see again.

1900. *May* 31. *London*.—Both medals—the Watson and the Bruce—have reached me—and have apparently so impressed the Admiralty that on the Queen's Birthday I was gazetted K.C.B. . . . You see what frightful consequences have followed your over generous appreciation of my work!

1901. *Jan.* 18. McClean remarks that wherever you find a bright Helium-spectrum star, you get a large quantity of the same type in the neighbourhood. . . . All the brighter stars of Orion seem to be type I. stars except α —and all included in one great nebula. . . . For wholesale parallax work photography is the thing—but for bright stars and these small parallaxes only the Heliometer is suitable. . . .

Our new Transit Circle will be here in a few days. [The letter goes on to describe his underground meridian mark device.]

1901. *March* 29. NEWCOMB to GILL. . . . At all events it seems that you have not yet abandoned telescopes for fire-arms.

I hope Roberts [Dr. Roberts of Lovedale, not Lord Roberts] is equally fortunate. Looking up his location on the map I see that it falls very near the region of a recent raid and I wonder whether his splendid work on variable stars is going to be interfered with. . . . I shall look with the greatest interest for the trial of your new circle.

1901. *July* 30. I do not know what to attribute Christie's action to I should be greatly obliged if you would carefully consider the whole matter and give me your opinion. . . . I am glad to hear you think so well of the Jupiter work. [This letter is accompanied by copy of his unanswerable criticism (for the Admiralty) of Mr. Christie's objections to the meridian marks proposed for the Cape Observatory. He summarizes some conclusions in his report in these words: "I further venture to express my belief that, in consequence of the depth below the surface of the ground and the age, thickness, extent and uniformity of the bed-rock, the proposed system of meridian marks will, if carried out, prove to be the most stable of any that has yet been erected at any Observatory in the world." Gill's arguments fortunately prevailed at the Admiralty, and his belief, as stated above, has been entirely corroborated by the result.]

1902. *July* 26. . . . I don't know if you share my tastes for military strategy and tactics—to me the whole thing was intensely interesting—but a shocking instance of the entire lack of military genius on part of our Generals—and a grand instance of pluck on part of Tommy Atkins.

1904. *Jan.* 22. . . . I think you would be very much interested, if you were here just now, to see the new Sidereal

Clock, which I have been erecting and experimenting with. . . . We sail for England on the 9th March.

1905. *March 24.* . . . No small part of my time is occupied with the approaching visit of the British Association to South Africa.

I do wish you could come here.

1905. *May 26.* I cannot tell you how much I regret that you cannot come.

1906. *March 26.* By last mail I sent in my application to the Admiralty for leave to retire from my present post in October next. . . . My doctor advises me not to spend another summer at the Cape.

1907. *March 19. London.* . . . Miss Clerke as a woman, a friend and a historian and original thinker in matters astronomical, has been a terrible loss. We loved her dearly. Her poor brother is left alone, so terribly alone. His case is a most pathetic one.

1908. *Feb. 12.* I have got the arc of meridian started at the northern end of Lake Tanganyika . . . and Lyons is pushing it southwards from Alexandria. So I may yet live to see it through.

1909. *Jan. 13.* My wife and I are very much concerned to hear that you have to undergo an operation.

34 DE VERE GARDENS, KENSINGTON, 1909, *May 31.*

MY DEAR NEWCOMB,—I have been a very bad correspondent of late. I heard you had been very ill, and I did not know if I might bother you with letters.

You have doubtless heard that the Fair Barbarian is a reality—we have actually got a glimpse of her—just enough to assure me that she is a reality—for luck has always been against our meeting.

The moment I got to Paris, or rather the first thing I did on the morning after our arrival there the previous night, was to go to the Rue de Fosses St.-Jacques, in search of Mrs. McGee, to find that the bird had flown to Switzerland, leaving behind to represent her a charming daughter and a little son who is a minor edition of Simon Newcomb. I fancy just exactly like what you were at his age. All this took place on the 23rd March—and then my time was much filled up with "Weights and Measures." We left Paris on the 1st April and spent a fortnight at Portofino (about 25 miles southward along the coast from Genoa)—where we had a

perfect time as guests of our old friend, the Dow: Lady Carnarvon—(her husband was Colonial Secy in Lord Derby's Govt and he was long Pres. of the Society of Antiquaries).

I ran up to Rome for two days to see St. Peters at Easter and get a glimpse of the Eternal City.

We returned, after a day in Genoa, to Paris, on the morning of the 17th April—and had a very busy and interesting week there—over the *Carte du Ciel* business—chiefly in connection with the Catalogue.

I think you will be interested to read the account of the meeting which I wrote for *Nature* (unsigned).

We got another peep at Miss McGee at lunch one day—and at the Observatory reception—but still no F.B.—and indeed, we only just got a flying peep at her on her way passing through London, which finally convinced me of her objective existence—though spiritually we are old friends. We had a great talk about you, and much do I wish the accounts of y^r health had been better.

We both love you well, that is certain—and there were a thousand things we might have talked about if we had more time—as it was I think we didn't lose much of the short time at our disposal.

I have got the great itinerary you prepared for me—but I think I must leave Canada out, and just arrange to leave my wife quietly somewhere in the East whilst I run to Lick and Mount Wilson. My wife has no fears as to a sea trip—but she is a very bad traveller by railway—a journey of 200 or 300 miles knocks her up for days. So I have to be very careful about her.

She joins me in loving remembrances to you and yours.

Ever thine,

DAVID GILL.

Professor Simon Newcomb died in July 1909.

LETTERS TO KAPTEYN

The first letter written by Gill to, and preserved by, Professor Kapteyn.

ROYAL OBSERVATORY, CAPE OF GOOD HOPE,
1884, September 27.

MY DEAR SIR,—Your kind letter of the 30th April has remained thus long unanswered because of my absence in England. . . . Absorbing work in England prevented me till a few days ago from reading your paper in *Copernicus*.¹

¹ *Copernicus*, vol. iii, pp. 147–182.

I shall certainly give your method of determining a fundamental latitude a good trial. . . . [The letter proceeds to extol his great 3-foot theodolite, just acquired; also his delicate precautions, in measuring the maximum elongation in azimuth of a star, by which he hopes to eliminate systematic error.]

1885. *January 18.* [In this letter minute details are given for applying Kapteyn's method as so to avoid systematic error. There are many letters in 1885 on this subject.] . . . But however perfect an instrument may be (and it is the astronomer's business to see that it is perfect) it is the astronomer's further business to look upon it with complete and utter mistrust.

The above letters contain evidence how the devoted friendship between these two astronomers arose out of mutual appreciation of the qualities required for the attainment of the most refined practical results. Then came the incidents connected with the C.P.D. related in the narrative part of this book. Then hundreds of letters follow in regard to their common work, full of technical matter. A very few extracts alone can be given here to show the growth of feeling, on the part of each, from scientific appreciation to affectionate devotion. All these letters are from the Cape, unless otherwise stated.

1886. *Jan. 9.* MY DEAR SIR,—Such a letter as yours of Dec^r 16 requires an immediate answer—I refer of course to its concluding portion in which you offer some years of your life to co-operation with me in cataloguing the photographic Durchmusterung of the Southern Heavens.

It is not easy to tell you what I feel at receiving such a proposal. I recognize in it the true brotherhood of science and in you a true brother. [The letter, 13 quarto pages, goes on to discuss plans of working. The same subject fills most of the correspondence with Professor Kapteyn for many years.]

1886. *Jan. 22.* MY DEAR SIR,—Your delightful letter of the 23rd Dec^r makes full amends for the disappointment I felt at not receiving your promised letter by last mail. . . .

I wish I knew you personally—I do know you, I think, pretty well—but I wish you would send me your photograph—I send you mine.

[On the 16th June, 1886, he encloses copy of a valuable

letter he wrote to Professor Stokes about the opposition in a certain quarter to support of the C.P.D. by funds administered by the Royal Society.]

216 UNION STREET, ABERDEEN, *March 29, 1887.*

MY DEAR KAPTEYN, . . . I feel quite ashamed at being so long in answering the very satisfactory and delightful letter which I received from you at Paris. I think I am sufficient judge of character to find out what manner of man you were during the happy days that we spent together.

Still it is very pleasant to be assured in plain English, and in the manly terms which you employ, y^r fixed resolution to stick to the work you have undertaken, through thick and thin—and that, having put your hand to the plough, no consideration will move you from the work you have begun—and no temptation can cause you to turn back from it.

If you enjoyed my visit—no less I assure you, did I enjoy mine. Your happy family life, our common interests and the, to me, very interesting chats we had together, make a very bright spot in my visit to Europe.

At this date there are many letters recounting the miserable spirit of attacks against the C.P.D., the pecuniary support offered by the Berlin Academy to the C.P.D., the indignation expressed to the Greenwich Board of Visitors by Adams, the support of the C.P.D. by members of the Paris Congress, the letter from Auwers on the astronomical necessity of the C.P.D., printed, circulated and supported by Stokes, and the final determination of Dr. and Mrs. Gill to introduce domestic economies at the Cape (among others, Mrs. Gill giving up her carriage), so that they might defray the cost at their own expense.

A great deal of correspondence passed between these two about the Astrographic Chart and Catalogue. Naturally, their unique experience in photographing and measuring the plates for a catalogue, possessed by no other astronomer, led the permanent committee to rely upon their advice on many points. The responsibility thus thrown mainly upon Gill led to preparatory discussions by correspondence which would occupy too much space to insert here. It is astonishing how much designing and inventing resulted.

1890. *Sept. 29.* MY DEAR KAPTEYN,—You already have my congratulations about the parallactic micrometer. So I

need say no more about the matter—except that you are not quite so mad with delight as I should have been.

1891. *June 6. London.*—Have you read Pickering's paper in No. 3025 of the *Ast. Nach.*? There you will find that the brighter stars of the Milky Way are all stars of the Sirius type, *i. e.* very white stars, very rich in photographic rays, and therefore the photographic diameters in our Durchmusterung plates show that this is also true for the fainter stars—that, in fact, the stars in the Milky Way are chemically different—or rather in an earlier stage of stellar evolution than the stars in the rest of the sky. It is a supremely interesting fact worthy of the fullest discussion.

1892. *March 29.* The Victoria and Sappho reductions which are immensely complex and laborious occupy most of the time, and I have been working at them early and late, for I am most desirous to reach the result by the end of this year, in order that Newcomb may include the result in his new discussion of Astronomical constants.

1892. *July 6.* The mail has just arrived bringing your welcome letter with the jubilant "*finished.*" There remains only now time before this letter must be posted to say how delighted I am to hear the good news and how sincerely I congratulate you. I, too, have just finished a long job—the discussion of the Triangulation of the Victoria comparison stars.

1893. *Nov. 20.* The defects of the parallactic instrument which you describe are precisely those which I wd have anticipated—viz. the effect of the slow motion in R.A. in changing the Declination. It was precisely this error in nearly all Equatoreals which made the Victoria and Sappho observations in 1882 (Galle's method) abortive.

1894. *Sept. 11.* What a pleasure your kind, manly and sympathetic letter was. . . .

I am not going just now to write you about all the troubles I have had in the past. It is sufficient to say that a deliberate attempt was made to hand over the Observatory to the Cape Gov't—which would have been equivalent to its extinction—and the appointment of a successor to George Maclear (one of my assistants who had retired) was refused—in consequence of statements made to the Treasury that I had been neglecting my proper duties and been observing minor planets and other pursuits on my own account. Fortunately, Newcomb wrote me a letter acknowledging in strong terms the value of the Cape work to the American Ephemeris—which gave the lie

direct to my false accusers, and ended in my getting a warm official letter of thanks from the Admiralty for these very services.

. . . and last mail brought me a letter which has fairly taken away my breath.

Mr. Frank McClean writes to say that he is desirous of presenting a large telescope to the Cape Observatory, for astro-photo. and spectroscopic work. . . .

I can hardly doubt that the Admiralty will accept such a splendid offer in the same spirit in which it has been made.

1895. *April 9.* I have no words to express my delight and satisfaction in your work, nor my sense of the value of the great service you have rendered to astronomy by this work. . . . It is a great satisfaction to me to think—on no less authority than that of your dear wife—that the *Durchmusterung* has not been over much work for you. I mean that you are physically and mentally better and not worse for your labours. . . . Above all, I rejoice in the true friend I have found in you—may that friendship ever grow with our years.

1898. *Feb. 23.* I am very glad that you are pleased with the *Cape Annals*, Vols. VI and VII. [Solar Parallax.] I do think you have described its leading feature—viz. the *reality*—or at least the earnest endeavour to seek out the *reality*—of the results, and the *reality* of the probable errors, and to hunt out all sources of systematic error. That has been my main endeavour, and I am very pleased that you think I have succeeded.

1899. *April 6.* A thousand heartiest congratulations on the completion of the *Durchmusterung* Catalogue. What a load off your weary shoulders! How splendidly you have redeemed the promise you made me in 1884, and how thoroughly you have done your great work! It will ever remain a standing memorial of y^r devotion to Science, y^r earnestness of purpose and y^r wonderful working capacity. . . .

De Sitter is going on with the parallax of the big proper motion star and his photometer work, and making good progress with the reduction of the Jupiter Satellite Heliometer observations. He seems very happy in his married life, and his wife acts as clerk to him in his observing.

1902. *Jan. 29.* I am so glad to find that the grant of the medal [Gold Medal, R.A.S.] has been duly confirmed and that it gives you such satisfaction.

You are quite right when you say that the most valuable part of these recognitions is the weight which they give to

one's recommendations and the leverage they give in procuring additional funds for research.

1905. *October* 18. . . . I have a letter dated November 6th from my old Chief Lord Crawford to say that he was sailing that day in his yacht, the *Valhalla*, for the Cape via Tristan d'Acunha and neighbouring islands where he was to hunt for "Birds and Bugs" for the British Museum. He expected to arrive in about 2 months so he may drop in any day. I am looking forward with immense interest to showing him the Cape Observatory.

After Sir David Gill retired to London his correspondence with Professor Kapteyn became even more continuous than in the previous twenty years, and their meetings were more frequent. The following letters are all dated from De Vere Gardens unless otherwise stated. Kapteyn's theories and deductions became one of Gill's greatest interests.

1907. *Dec.* 10. . . . I have a most troublesome set of lectures to deliver at the R¹ Institution.

I undertook it for the sake of "filthy lucre"—and only set about the preparation a few days ago.

1908. *April* 14. I was so glad to hear some time ago that you are going to lecture at the Royal Institution on the 22nd May, and my wife wrote to Mrs. Kapteyn to say that we hoped you would both be able to come to England and stay with us.

1908. *April* 29. I wrote Dyson asking him to come up from Edinburgh when you come, or rather, asking if he could manage it. He is delighted. . . . He will meet you at dinner on the 23rd May. I am writing to Eddington to ask him to come also. So we shall have a "star-streaming" dinner.

1911. *July* 3. . . . We have been all coronation mad here. Now it is all happily over—a marvel of organization and, thank God, free from accidents or misfortunes of any kind. On the Thursday I was in Westminster Abbey—a wonderful experience. On the Friday I watched the procession from the Athenæum, and on Saturday went to the Naval Review as an Admiralty guest. I had the good fortune to be with Sir Philip Watts (Chief Constructor of the Navy) whilst we sailed through the fleet—so I got from him the history of all the different types of ships and the reasons for the successive changes of type. To-day I have been at Cambridge with the Geodetic Compareteurs for India—and at a meeting with

Dyson, Newall, Darwin, Larmor, as a joint committee of the R¹ Society and R.A.S. to consider the future work and staff of the Nautical Almanac Office.

34 DE VERE GARDENS, KENSINGTON, *April 17, 1912.*

MY DEAR KAPTEYN, . . . My time has been a great deal taken up in connection with the plans for the telescope and dome for Santiago; with an apparatus for determining the temperature coefficient and absolute lengths of Geodetic bars for the Survey of India and experiments with the completed apparatus mounted in London; final details about the mounting of the Johannesburg telescope, etc., etc.

Besides that I have undertaken the Presidency of the Research Defence Society in succession to Lord Cromer who has just retired from it. Perhaps you do not know that, in this country, there are 13 anti-vivisection societies which are doing their best to prevent research involving vivisection, and they are supported with very large funds subscribed by all the nervous old and young women who keep pet lap dogs and think they are more valuable than the lives of human beings. Of course, we have all the intelligence of the country on our side¹ and we have to do our best to defend honest research against the attacks of the large body of ignorant people who have votes, and the politician only cares for votes, so that there is always danger of such restriction being imposed by law as to render effective research impossible. But I am getting into quite a long letter about matters which do not directly concern you.

I am sorry to say that we are no further advanced than before with getting optical glass for the Santiago and Johannesburg telescopes; Grubb has ordered duplicate discs from Chance. I am going down to Birmingham next week to see them and I moved and carried unanimously at the annual meeting of the Directors of the National Physical Laboratory a motion that the Laboratory should take steps in co-operation with the great glass manufacturers to institute experiments for the improvement of optical glass and its production.

We are expecting Backlund in London early in July about his new equatoreal for Nikolaieff and his reflector for Semeis, and he will at the same time attend the celebration of the 250th Anniversary of the Foundation of the Royal Society of London.

Most of the time I can spare for other things has been given to the completion of the *History of the Cape Observatory*, the description of which, as you know, is printed, awaiting

¹ Cf. p. 328.

the history as its introduction. I had hoped to complete the *History* in 20 pages (each page about equal to 4 of an ordinary book) but I have already got to 100 and am not finished, and I do not think there is a word of it that will not be interesting to Astronomers, although, of course, they know something about it already. I have been in correspondence with De Sitter in connection with the part referring to Jupiter's Satellites and I am adding to that chapter a programme of the observations necessary for the next ten years to complete the data for a thorough determination of the libration and other constants of a new theory. . . .

I shall be greatly interested to hear the outcome of your researches on the helium stars. I envy you in the great field of research which you have on hand. I find myself, as I explained to you, thrown by force of circumstances into quite another direction of work, but I hope not a useless one.

When are you coming to London on your way to America? . . .

Our love to you and yours. Ever thine, DAVID GILL.

1912. May 12. . . . It will be such a joy to see you and Mrs. Kapteyn. . . . Yes, indeed—we, too, were full of the terrible business of the *Titanic*. We had only one friend on board—Lady Rothes—mercifully she was saved—and indeed behaved quite heroically. . . .

Eddington is, I think, the soundest man we have in England on things cosmical.

1913. June 5. MY DEAR KAPTEYN,—I am inviting Dyson, Eddington, Chapman, Hills (President R.A.S.), Pickering, Hough, and Rambaut to meet you on the afternoon of the 17th instant at 3 o'clock. Kindly tell me if there are any others you would wish present. Yours ever, DAVID GILL.

1913. October 31. A little post card from your wife to mine tells me that you are once more back on this side of the Atlantic, and so I am sending you a copy of my *History and Description of the Cape Observatory*. . . .

We had a delightful holiday; from July 16 to August 9 in Wales, and then until September 25th at Pitlochrie, in Perthshire, whence my wife returned to London, and I went for some deer-stalking in Argyllshire till October 1. I got a fine stag one day, but had two blank days. The season was a late one, so that the big stags had not come down from the very high mountains to the ground, only 2000 ft. above the sea, on which I was stalking; but I had a rare good time, glorious weather, and enjoyed myself hugely.

I am looking forward to the receipt of a letter from you with great interest.

LETTERS TO PROFESSOR G. E. HALE (U.S.A.)

All of the following letters to G. E. Hale are dated from 34 De Vere Gardens, Kensington.

1909. *Jan.* 5. . . . I am looking forward very much to Kapteyn's arrival in the hope of hearing all about the wonders of your observatory, and the results of his talks with you.

I have not been very well since the beginning of October—not seriously ill, but out of sorts, and only able to do the things most pressing, and these seem to be continuous—committees, lectures, Council meetings, surveys, a couple of books on the stocks, etc., etc. . . .

About coming to America next year. My wife is a very bad traveller by railway. A considerable railway journey—say 10 or 12 hours—knocks her up for at least a week—a few such would have the most serious results—and we are a very Darby and Joan old couple who like to be together as much as possible. . . .

This year also I have to attend the Committee of the International Bureau of Weights and Measures at Paris, March 21—Apr. 1, and the Astrogaphic Congress, Ap. 19–24. Between the two we think of going to Italy which we have never seen. . . .

1909. *Jan.* 19. Kapteyn writes that there is a possibility of your coming to Paris for the Astrogaphic meeting, April 19–24. This is glorious news. . . .

Newcomb writes me that he was on the point of undergoing an operation—and, tho' he speaks lightly of it I am very anxious about the result.

1909. *Aug.* 11. . . . I have just been asked to look after the construction of a 26 inch refractor of 36 feet focus for Innes at the Cape. The Transvaal Gov^t has voted the money.

1909. *Oct.* 26. . . . Dear old Vogel once said to me at Potsdam, "My dear Gill, if you loaf me send me some peetels (beetles) from de Cape"—Now, if you love me, send me some slides.

1910. *April* 7. On May 20 I have promised to give a Friday evening lecture at the Royal Institution on "The Sidereal Universe"—and I want to bring together the facts that have been recently determined. 1. I wish very specially to illustrate how "the light of the great nebula in Andromeda and of 3 star-clusters has been shown photographically to

contain a larger proportion of the less refrangible rays than the light of stars of the same spectral type." [He adds 3 more points he wants to illustrate by work done with Hale's 60-inch reflector.]

Amongst other things I wish to make an appeal for funds to start a large reflector in the Southern Hemisphere, by showing what you are doing at Mount Wilson. I hear that some of the wealthy men in Johannesburg are likely to respond.

1910. *May 15*. . . . The death of our beloved King has thrown the country into the deepest gloom. . . . We had such a terribly sad meeting at the R.A.S. on Friday. We did none of the usual business, but simply passed, in silence, the motions of sympathy and congratulation to the King, and of condolence with the Queen Mother and Lady Huggins.

Huggins' death was terribly sudden. Just one week before his death he attended a meeting of a joint committee of the Royal Soc. and R.A.S. . . . He passed away quietly full of years and honour—and I am afraid we are not likely to see his like again. He has been a true friend to me for 47 years . . . the sad state of my wife's health, which Kapteyn will tell you all about, is such that I *dare not* go to the Solar Congress.

It is a very bitter disappointment to me, but there are things dearer to a man than any congress, any gratification of friendship or the desire to see and know. . . .

I have such a deep interest in your work, in Pickering's, in that going on at Mount Hamilton and at the Yerkes Observatory—I have so many kind colleagues and friends in America that I desire to see—all these things are very hard to give up.

1910. *Nov. 26*. [This is a long and searching criticism of a proposed design for the 100-inch reflector, and his own suggestions. In an endorsement, G. E. Hale fully concurs. The subject is discussed, after careful consideration of working drawings, in a letter 1911. Feb. 28.]

On April 12, 1911, Sir David wrote a letter to Hale giving a full account of his visits to the St. Gobain's Glass Factory to see what progress was being made with the glass disc for the great 100-inch mirror. It is endorsed by G. E. Hale with this remark: "This letter is one of several which illustrate how much we owe to Gill in connection with the 100-inch telescope." In the letter he describes the attempt to make a disc.

They had actually cast a full-sized disc of 40 centimetres in thickness and after it had been annealed as far as temperature 55° or 60° Cent. it remained still whole and they believed that they had been entirely successful; but before it reached the temperature of the outer air it developed a number of cracks as shown in sketch. This disc had been cast in a great tank—a tank being a distinct thing from a pot, a pot being defined as a vessel which could be lifted out of the furnace and the central parts of the contents poured into the mould; whereas a tank is fixed, surrounded by a furnace and the glass allowed to flow into the mould from it.

After giving technical details of the relative advantages of pots and tanks, and the uncertainty of the possibility of making a pot large enough to contain the quantity of glass required for filling a mould 40 centimetres deep from a single pot, he says that any such attempt would require about a year to make the pot and probably at least another year before all the machinery for lifting and pouring could be constructed, besides time for experiments and for the very slow annealing.

He mentions a suggestion he had made to Mr. Delloye, who thought it practicable, of a method, founded upon actual experience, for casting two 20-centimetre discs, polishing a surface of one plane, the other convex, and moulding them together at moderate temperature, excluding air-bubbles by that process. He gives details about testing the coefficients of expansion of the two discs.

It is a long and very interesting technical letter, showing intimate knowledge on the subject of glass making such as is possessed by few astronomers.

At this period Dr. Hale's health suffered severely during some years from overwork.

1911. *April* 13. We came back here from Paris on Saturday. I enclose letter to you about the 100-inch telescope question. Don't read it if you are not up to the mark.

1911. *October* 21. . . . I am just running over to Paris for a Congress about Nautical Almanacs.

1912. *November* 26. . . . About our great friend Darwin, I fear there is no hope of his recovery. On the morning of the 13th instant I got a letter from Darwin's married daughter

to say that her father had been unable to see me, he was practically so low that he could not speak and had been almost in a comatose condition, on the 12th he had rallied considerably, spoke of me, sent me his love and his good-bye. On the following morning, however, I received a letter from Lady Darwin to say that the rally had continued and that he was anxious to see me, so I went at once to him and had a talk with him for about twenty minutes.

He began by saying that he knew he had only a few days or perhaps a few weeks to live, but that for him the bitterness of death was passed and he was content to go, his chief regret being that his death would cause his wife so much sorrow.

He was absolutely and entirely calm, spoke of things going on in the scientific world, discussed the War,¹ the Scene in the House of Commons on the previous day and even cracked some jokes on things in general. It was really splendid to see a man so absolutely tranquil in mind under such circumstances.

After telling me one or two things he wished me to do for him he bade me quietly good-bye, and I fear I shall never see him again, but he still continues to linger on, the process of exhaustion being apparently slower than was anticipated.

I shall lose in him one of my best and most trusted friends.

I am greatly interested in the accounts you give of your experiences with the 100 inch disc. . . . I am distinctly of opinion that a perfect disc of about 20 centimetres thickness would be sufficient for your purpose if mounted with the very beautiful means of support which are described in the account of the 60 inch.

The getting of glass is a universal trouble just now, I mean not, of course, so much for reflectors (at least, up to the size of 60") but for refractors of any size above 18 inches. We have waited now nearly three years in the hope of getting 26 inch discs for the Johannesburg telescope. I am also looking after a 24-inch telescope for Ristenpart at Santiago [Chile] and a 32-inch for Nicolaieff, and all that it is possible to do is to encourage Messrs. Chance in every possible way to do their best. They are now trying pots of 8 times the cubic capacity of their former pots in the hopes of getting blocks of uniform glass in the centre of these meltings, and they are trying to improve their modes of stirring. I cannot tell what has happened to the people in Paris and Jena. They must have lost some old hands who had little secrets which have died with them or who had more perseverance or a higher sense of duty in connection with stirring. I do not know what it is but the fact remains that nobody seems

[¹ The Balkan War.]

to be able to get large discs of optical glass in the present day, and yet not so long ago Mantois was able to provide 36 and 40 inch discs.

I am trying to get the *History and Description of the Cape Observatory* out of hand. I have been at it for a long time through many interruptions.

1913. June 17. It is good of you to let me know of your coming.

I will call about 3.15 at Brown's Hotel on Sunday for a short crack. I know it must not be too long.

This afternoon Kapteyn, Pickering, Dyson, Eddington, Russell, Hough, Rambaut, Fowler, Chapman, Schleisinger, and Hills were here for a palaver of a couple of hours.

Kapteyn leaves London to-morrow morning with his wife for Mount Wilson. I am sorry to say my wife is very far from well. But all news when we meet. My wife joins in warmest regards.

The next letter is endorsed from G. E. Hale: "My last letter from Gill."

1913. Nov. 1.—I have written a book, the *History and Description of the Cape Observatory*. . . . Dyson is to distribute it along with the other publications to be sent to Mount Wilson.

I do not know that you will find anything new in the book and yet, though it has cost me a lot of work, I think it is worth while to put together in one collective history the brief account of the total contribution of the Cape Observatory to Astronomy, and a description of the new instruments which have been erected under my instructions at the Cape. . . . I just recently returned from Paris, where I had much interesting communion with our mutual friend Stratton of your Standard Department. . . .

We spent a delightful holiday, first three weeks at Llan-drindod, in Wales, where I drank nasty smelling waters and played much golf for the benefit of my constitution, busying myself in the mornings with work connected with the book which I have been writing, and in particular with the formation of the index which appears at the end of it. Then we went on the 9th of August to Pitlochrie, in Perthshire, where I still employed the mornings on the index, etc., and in the usual matters of correspondence, and in the afternoons played golf, but with not a few whole days devoted to the fascinating process of grouse shooting, and had capital sport on various moors in Perthshire and Invernesshire.

On September 25th I went to Sir Andrew Noble's at Ard-

kinglas in Argyllshire, where I went deer-stalking for three days, but had the luck only to get a shot on one day, the result being a very fine 8-pointer stag. . . .

I returned to London on the 1st October, and was from the 6th to the 19th in Paris, attending the Committee and Conference meetings connected with the International Bureau of Weights and Measures, where, as I have already said, I met Stratton.

After that I had a couple of days excellent partridge and pheasant shooting, and now, here I am, settled down to work for the winter, although I have three days' pheasant shooting yet before me.

With all this I am in capital health.

APPENDIX II

PAPERS BY

SIR DAVID GILL, K.C.B.

KNIGHT OF THE PRUSSIAN ORDER *POUR LE MÉRITE*,
COMMANDER OF THE *LÉGION D'HONNEUR* (FRANCE),
HON. LL.D., ABERDEEN AND EDINBURGH; HON. D.Sc.,
OXFORD, CAMBRIDGE, DUBLIN, AND CAPE OF GOOD HOPE,
F.R.S., HON. F.R.S.E., FOREIGN SEC. R.A.S.

Correspondant de l'Institut de France (Académie des Sciences) et du Bureau des Longitudes (France); Foreign Member della Reale Accademia dei Lincei, Roma; Foreign Member of the Royal Academy of Sciences, Amsterdam; Corresponding Member of the Imperial Academy of Sciences, Petrograd. FOREIGN MEMBER of the National Academy of Sciences, Washington; of the Royal Academy of Sciences of Sweden; of the Société Hollendaise Nationale des Sciences (Haarlem); of the American Academy of Arts and Sciences (Boston); of the American Philosophical Society of Philadelphia; of the Italian Spectroscopic Society (Rome). HONORARY MEMBER of the New York Academy of Sciences; of the Société des Sciences de Finlande (Helsingfors); of the Royal Society of Glasgow; of the Royal Society of South Africa; and First Honorary Member of the Astronomical and Astrophysical Society of America. CORRESPONDING MEMBER of the Société Nationale des Sciences, Cherbourg; of the Sociedade de Geographia, Lisbon, etc.

Bruce Medallist of the Astronomical Society of the Pacific (1900); Watson Medallist of the National Academy of the United States (1900); Gold Medallist of the Royal Astronomical Society of London (1882 and 1908); Royal Medallist of the Royal Society of London (1903); Valz Medallist of the Institute of France (Acad. des Sciences) (1882).

Prepared by Mr. W. H. Wesley, Assistant Secretary, Royal Astronomical Society.

LIST OF PAPERS

[As a rule the official publications of the Cape Observatory have not been included in this list.]

- Note on Stars within the trapezium of the Nebula in Orion. *R. A. S. M. N.*,¹ Vol. 27, 1867, pp. 315-316.
- A suggestion in the use of chronometers, with a view to its use in the approaching transit of Venus. *R. A. S. M. N.*, Vol. 32, 1872, p. 216.
- On the proposed expedition to observe the approaching opposition of Mars. *R. A. S. M. N.*, Vol. 37, 1877, pp. 310-326.
- On the opposition of the Minor Planet Ariadne as a means of determining the solar parallax. *R. A. S. M. N.*, Vol. 37, 1877, pp. 327-333.
- On the opposition of the Minor Planet Melpomene as a means of determining the solar parallax. *R. A. S. M. N.*, Vol. 37, 1877, pp. 412-422.
- Reports of his expedition to Ascension (1877). *R. A. S. M. N.*, Vol. 38, 1878, pp. 2-11, 57-58, 89-90.
- Observations of Mars obtained at Ascension between July 31 and September 4 [1877], both inclusive. *R. A. S. M. N.*, Vol. 38, 1878, pp. 17-21.
- The determination of the solar parallax. *Observatory*, Vol. 1, 1878, pp. 7-13, 38-44, 74-82, 101-106, 129-134, 273-280.
- On the progress of the reductions connected with the Ascension Expedition. *R. A. S. M. N.*, Vol. 39, 1879, pp. 51-72.
- On the results of Meridian Observations of the Mars comparison stars. *R. A. S. M. N.*, Vol. 39, 1879, pp. 98-123.
- On the observations of α Centauri made with the heliometer at Ascension in 1877. *R. A. S. M. N.*, Vol. 39, 1879, pp. 123-126.
- On a new method of determining astronomical refractions. *R. A. S. M. N.*, Vol. 39, 1879, pp. 366-368.
- On the value of the solar parallax derived from observations of Mars made at Ascension Island during the opposition of 1877. *R. A. S. M. N.*, Vol. 39, 1879, pp. 431-437.
- Observations of the great southern Comet, 1880, I., made at the Cape of Good Hope, February 2 to February 15. *R. A. S. M. N.*, Vol. 40, 1880, pp. 300-301.
- First report [1879] of the Committee appointed to consider the question of improvements in astronomical clocks. *Brit. Ass. Rep.*, 1880, pp. 56-58.
- Observations of Comet I., 1880, made at the Royal Observa-

¹ *Royal Astronomical Society Monthly Notices.*

- tory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 40, 1880, pp. 623-627.
- Account of a determination of the solar parallax from observations of Mars made at Ascension in 1877. *R. A. S. Memoirs*, Vol. 46, 1881, pp. 1-172.
- Annual Address . . . July 30, 1880 [On the determination of the Earth's mean distance from the Sun]. *S. Africa Phil. Soc. Trans.*, Vol. 2, 1881, pp. xxiii-xliii.
- Observations of the Comet *a*, 1880. *Ast. Nach.*, Vol. 98, 1881, col. 29-30.
- On the solar parallax derived from observations of Mars at Ascension in 1877. *R. A. S. M. N.*, Vol. 41, 1881, pp. 317-325.
- On the best mode of undertaking a discussion of the observations of contact to be made at the approaching Transit of Venus. *R. A. S. M. N.*, Vol. 42, 1882, pp. 285-286.
- On the effect of different kinds of thermometer screens, and of different exposures, in estimating the diurnal range of temperature at the Royal Observatory, Cape of Good Hope. *Meteorol. Soc. Quarterly Journal*, Vol. 8, 1882, pp. 238-243.
- On observations of Comets, 1881, II. and III., of Wells' Comet, and of the great Comet (*b*), 1882, made at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 43, 1883, pp. 7-19.
- Notes on the great Comet (*b*), 1882. *R. A. S. M. N.*, Vol. 43, 1883, pp. 19-21.
- On photographs of the great Comet (*b*), 1882. *R. A. S. M. N.*, Vol. 43, 1883, pp. 53-54; and *Paris Acad. Compt. Rend.*, Vol. 95, 1882, pp. 1342-1343.
- On the Victoria and Sappho observations [1882]. *Ast. Nach.*, Vol. 104, 1883, col. 55-58.
- Note on some criticisms made by Mr. Stone on the methods available for determining the solar parallax. *R. A. S. M. N.*, Vol. 43, 1883, pp. 307-315.
- Note on the nucleus of the great Comet (*b*), 1882. *R. A. S. M. N.*, Vol. 43, 1883, pp. 319-321.
- Preliminary account of a telegraphic determination of the longitude of the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 43, 1883, pp. 408-419.
- Nouvelles recherches sur les distances des Étoiles. *Astronomie*, 1884, pp. 456-459.
- Note on Nyrén's determination of the constant of aberration. *R. A. S. M. N.*, Vol. 44, 1884, pp. 275-277.
- Observations of Comet, 1884 (Barnard), made at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 45, 1885, pp. 45-49, 477.
- On systematic errors in the readings of the circle microscopes of the Cape Transit Circle [1884]. *R. A. S. M. N.*, Vol. 45, 1885, pp. 64-90.
- Observations of Comet, 1884, II. (Barnard), made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 110, 1885, 201-206; Vol. 112, 1885, 187-188; *R. A. S. M. N.*, Vol. 45, 1885, pp. 476-477.
- Observations of Comet, 1884, I. (Pons, 1812), made at the Royal

- Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 112, 1885, 141-144; *R. A. S. M. N.*, Vol. 45, 1885, pp. 471-476.
- Observations of Comet, 1884, III. (Wolf), made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 112, 1885, 257-260; *R. A. S. M. N.*, Vol. 45, 1885, pp. 478-480.
- Mean places of stars observed with Comet, 1882, I., from observations with the transit-circle at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 112, 1885, 393-396.
- Reply to Mr. Stone's paper on screw errors as affecting the N.P.D. of the Cape Catalogue for 1880. *R. A. S. M. N.*, Vol. 45, 1885, pp. 432-444.
- The Cape Catalogue for 1880 [letter to the Editor]. *Observatory*, Vol. 8, 1885, pp. 176-177.
- Sternschnuppenfall, 1885, November 27. *Ast. Nach.*, Vol. 113, 1886, 369.
- Observations of Comet, 1885, II., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 114, 1886, 121, 122.
- Beobachtungen des Cometen, 1886 (Fabry), am Cap der Guten Hoffnung. *Ast. Nach.*, Vol. 114, 1886, 235-236.
- On some suggested improvements in the practical working of M. Loewy's new method of determining the elements of astronomical refraction. *R. A. S. M. N.*, Vol. 46, 1886, pp. 325-328.
- Photographie astronomique. *Bull. Astron.*, Vol. 3, 1886, pp. 161-164, 321-323.
- Sur les meilleures dispositions instrumentales pour la détermination des éléments de la réfraction au moyen de la méthode de M. Loewy, Paris. *Ac. Sci.*, C.R., Vol. 102, 1886, pp. 732-735.
- Recent researches on the distances of the fixed stars and some future problems in sidereal astronomy [1884]. *Roy. Inst. Proc.*, Vol. 11, 1887, pp. 91-106.
- Observations of comets made at the Royal Observatory, Cape of Good Hope, in the year 1886. *Ast. Nach.*, Vol. 116, 1887, 305-316; *R. A. S. M. N.*, Vol. 47, 1887, pp. 277-293.
- Observations of comets made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 117, 1887, 339-340.
- Schreiben betr. Beobachtungen des Cometen, 1888, I., nebst Mittheilungen über den Fortgang der Durchmusterung des südlichen Himmels und das neue Heliometer. *Ast. Nach.*, Vol. 119, 1888, 257-262.
- On the occultations of Döllén's list of stars, observed at the Royal Observatory, Cape of Good Hope, during the total eclipse of the moon, 1888, January 28. *R. A. S. M. N.*, Vol. 48, 1888, pp. 297-299.
- The applications of photography in astronomy [1887]. *Roy. Inst. Proc.*, Vol. 12, 1889, pp. 158-172; *Bull. Astron.*, Vol. 4, 1887, pp. 361-380.
- [On recent work at the Cape Observatory; letter to the Editor.] *Observatory*, Vol. 11, 1888, pp. 85-87.
- Note on Investigations on the accuracy of the Paris photographs [Astrographic Charts]. *Observatory*, Vol. 11, 1888, pp. 292-296.
- The Photographic Chart of the Heavens [reply to criticism, *re*

- Catalogue of Stars to the 11th Magnitude]. *Observatory*, Vol. 11, 1888, pp. 320-326.
- Observations of Comet, 1888 (Encke), made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 120, 1889, 43-44.
- Elemente des Cometen, 1889 (Davidson). *Ast. Nach.*, Vol. 122, 1889, 191-192.
- On the determination of errors of graduation without cumulative error, and the application of the method to the scales of the Cape heliometer. *R. A. S. M. N.*, Vol. 49, 1889, pp. 105-118.
- Catalogue of Stars to the 11th Magnitude [letter to Editor]. *Observatory*, Vol. 12, 1889, pp. 438-440, and Vol. 13, 1890, p. 89.
- Observations of Comet, 1889, IV., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 124, 1890, 27-30; Vol. 126, 1891, 55-58.
- Note on the parallax of β Orionis. *Observatory*, Vol. 13, 1890, pp. 289-291.
- Note on some experiments with the new Cape astrophotographic telescope. *Observatory*, Vol. 13, 1890, pp. 351-353.
- Observations of Comet, 1891, I. (Barnard-Denning), made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 128, 1891, 175-176.
- Entdeckung eines Cometen, 1892 (Swift, März 6). *Ast. Nach.*, Vol. 129, 1892, 119-120.
- Observations of Comet, 1892, I., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 130, 1892, 55-58.
- On the definitive places of the stars used for comparison with the planet Victoria in the observations for parallax, 1889. *Ast. Nach.*, Vol. 130, 1892, 161-178.
- Observations of occultations of faint stars during the total eclipse of the moon on November 15, 1891, made at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 52, 1892, pp. 164-168.
- Observations of Comet, 1892 *a* (Swift), made at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 52, 1892, pp. 568-569.
- Méthode de montage des plaques sensibles, détermination de leur orientation, Paris. *Comm. Int. Carte du Ciel, Bull.*, Vol. 1, 1892, pp. 7-50, viii.
- Note relative au mémoire de M. le Prof. J. C. Kapteyn [exposé de la méthode parallactique de mesure. Réduction des Clichés], Paris. *Comm. Int. Carte du Ciel, Bull.*, Vol. 1, 1892, pp. 115-124.
- Notes relatives à différents mémoires contenus dans le premier fascicule du Bulletin du Comité, Paris. *Comm. Int. Carte du Ciel Bull.*, Vol. 1, 1892, pp. 128-132, viii.
- Exposé d'un projet de M. J. C. Kapteyn relatif à la détermination des mouvements propres et des parallaxes d'étoiles, Paris. *Comm. Int. Carte du Ciel Bull.*, Vol. 1, 1892, pp. 262-264.
- An astronomer's work in a modern observatory [1891]. *Roy. Inst. Proc.*, Vol. 13, 1893, pp. 402-416.
- On the reduction of distances from heliometer observations. *Ast. Nach.*, Vol. 131, 1893, 185-192.

- Observations of Comet, 1892, VI., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 133, 1893, 193-196; *R. A. S. M. N.*, Vol. 53, 1893, pp. 488-489.
- Observations of Comet Finlay, 1893, made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 133, 1893, 329-332.
- Opposition of Mars, 1892; Observations made at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 53, 1893, pp. 112-115.
- Observations of Comet, 1893, II., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 134, 1894, 361-364.
- New variable star in Vela. *Ast. Nach.*, Vol. 135, 1894, 43, 44.
- Beobachtungen des Cometen, 1894 (Gale, April 3). *Ast. Nach.*, Vol. 135, 1894, 149-150.
- Mean places for comet-stars observed with the transit-circle at the Royal Observatory, Cape of Good Hope, in 1893. *Ast. Nach.*, Vol. 135, 1894, 381-382.
- Observations of Comet Tempel (1873, II., 1894), made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 135, 1894, 383-384; Vol. 136, 1894, 125-126.
- Observations of Comet, 1894, II. (Gale), made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 136, 1894, 123-126; *R. A. S. M. N.*, Vol. 54, 1894, pp. 585-586.
- Remarks on the best method of determining the positions of the planets by observation. *R. A. S. M. N.*, Vol. 54, 1894, pp. 345-357.
- On the investigation of the division errors of the scales of the Cape Repsold measuring apparatus, and the determination of the errors of the Oxford reseau [1892]. *R. A. S. Mem.*, Vol. 51, 1895, pp. 1-27.
- Preliminary note on observations of the minor planet Victoria in 1889 [1893]. *Edin. Roy. Soc. Proc.*, Vol. 20, 1895, pp. 47-49; *Bull. Astron.*, Vol. 10, 1893, pp. 248-250.
- Note on the latitude of the Royal Observatory, Cape of Good Hope [1894]. *R. A. S. M. N.*, Vol. 55, 1895, pp. 34-36.
- Meridian observations of Comet comparison stars made at the Royal Observatory, Cape of Good Hope, in 1893 and 1894. *Ast. Nach.*, Vol. 138, 1895, 331-334.
- Sur l'orientation de l'axe optique et du plan de la couche sensible, Paris. *Comm. Int. Carte du Ciel Bull.*, Vol. 2, 1895, pp. 102-106.
- A determination of the solar parallax and mass of the Moon from heliometer observations of the minor planets Iris, Victoria and Sappho made in the years 1888 and 1889 at the Royal Observatory, Cape of Good Hope, in co-operation with the observatories of Yale College (Newhaven), Leipzig, Göttingen, Bamberg and Oxford (Radcliffe), and from meridian observations made at all the principal observatories. Description of the heliometers and details of the heliometer observations. [Discussion of the triangulation of the Victoria comparison stars, and the heliometer observations of Victoria and Sappho. Combination of

- results and general conclusions.] *Cape Obs. Ann.*,¹ Vol. 7, 1896, pp. 1-72, 1 *bis*-403; Vol. 6, 1897, xliii. pp., (Pts. 1, 2) 539 pp., (Pt. 3) 83 pp., (Pt. 6) 32 pp.
- Sur cinq photographies de la région entourant η d'Argus, Paris. *Ac. Sci. C. R.*, Vol. 123, 1896, p. 29.
- Annual address to the members of the South African Philosophical Society, on September 27, 1893. [On the solar parallax.] *S. African Phil. Soc. Trans.*, Vol. 8, 1896, pp. xlix-lx.
- First [-fifth] list of double stars discovered at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 142, 1897, 369-374; Vol. 143, 1897, 171-174; Vol. 144, 1897, 89-94; Vol. 145, 1898, 93-96; Vol. 146, 1898, 369-372.
- New southern variable stars. *Ast. Nach.*, Vol. 143, 1897, 283-286; Vol. 144, 1897, 143-144.
- On the mean places and proper motions for 1900 of twenty-four southern circumpolar stars. *R. A. S. M. N.*, Vol. 57, 1897, pp. 532-533.
- New double stars found at the Cape Observatory in 1896. *R. A. S. M. N.*, Vol. 57, 1897, pp. 533-541.
- Propositions pour les valeurs des constantes astronomiques [faites à la Conférence Internationale des étoiles fondamentales de 1896], Paris. *Bur. Long. Ann.*, Vol. 5, 1897, D., pp. 57-90.
- On the effect of chromatic dispersion of the atmosphere on the parallax of α Centauri and β Orionis, and on a method of determining its effect on the value of the solar parallax derived from heliometer observations of minor planets [1897]. *R. A. S. M. N.*, Vol. 58, 1898, pp. 53-76.
- Observations of Comet, 1897, I., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 146, 1898, 203-204.
- On the parallax of Sirius and of α Gruis. *R. A. S. M. N.*, Vol. 58, 1898, pp. 78-83.
- Nebulæ observed at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 58, 1898, pp. 329-330; Vol. 59, 1899, pp. 339, 522.
- Reply to Dr. Rambaut's note "on the effect of chromatic dispersion." *R. A. S. M. N.*, Vol. 58, 1898, pp. 415-425.
- An account of telegraphic longitude operations connecting Aden and the Cape of Good Hope in the years 1881 and 1882. *Cape Obs. Ann.*, Vol. 1, 1898 (Pt. 2), pp. [1]-[68], 1-83, iv.
- On a new instrument for measuring astrophotographic plates [1898]. *R. A. S. M. N.*, Vol. 59, 1899, pp. 61-72.
- Note on the effect of wear on the errors of micrometer screws. *R. A. S. M. N.*, Vol. 59, 1899, pp. 73-76.
- Observations of meteors made at the Royal Observatory, Cape of Good Hope, on 1898, November 13 and 14. *R. A. S. M. N.*, Vol. 59, 1899, pp. 109-112.
- Note on the clock Hardy formerly used as the Cape transit clock. *Ast. Nach.*, Vol. 148, 1899, 237-238.
- Observations of Comet, 1898, VII., with the equatorials at the

¹ The importance of this research and one on stellar parallax demands their inclusion in this list, although Gill's publications in Cape Observatory Annals, and other observatory publications are generally excluded.

- Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 149, 1899, 141-142.
- On the discovery of a certain proper motion [letter to Editors]. *Observatory*, Vol. 22, 1899, pp. 99-100.
- Occultations of stars by the Moon observed at the Royal Observatory, Cape of Good Hope in the years 1881 to 1898. *Ast. Nach.*, Vol. 150, 1899, 393-428; Vol. 152, 1900, 283-284.
- On a method of obtaining perfectly circular dots unaffected by phase, and their employment in determining the pivot errors of the Cape transit circle. *R. A. S. M. N.*, Vol. 59, 1899, pp. 125-135.
- Occultations observed at the Royal Observatory, Cape of Good Hope, during the lunar eclipse, December 27, 1898. *R. A. S. M. N.*, Vol. 59, 1899, pp. 340-341, 522.
- On the presence of oxygen in the atmospheres of certain fixed stars [1899]. *Roy. Soc. Proc.*, Vol. 65, 1900, pp. 196-206.
- Observations of comets at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 151, 1900, 109-112.
- Observations of Comet, 1899, IV. (Tempel), with the transit circle of the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 151, 1900, 187-190.
- Researches on stellar parallax made with the Cape heliometer. Observers: David Gill, W. H. Finlay, W. de Sitter, and V. A. Lowinger. *Cape Obs. Ann.*, Vol. 8 (Pt. 2), 1900, (i)-(xvi), 1 B-173 B.
- Address delivered at the unveiling of the inscription stone of the Victoria telescope, Cape Observatory. *Observatory*, Vol. 24, 1901, pp. 397-402.
- Cape double star results, 1900. *R. A. S. M. N.*, Vol. 61, 1901, pp. 575-615.
- The spectrum of η Argûs. *Roy. Soc. Proc.*, Vol. 68, 1901, pp. 456-458 (reprint in *R. A. S. M. N.*, Vol. 61, 1901, appx., pp. 66-68).
- The great Comet, 1901 a. *Ast. Nach.*, Vol. 155, 1901, 319-320.
- The great Comet of 1901 as observed at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 61, 1901, pp. 508-512.
- Spectrum of η Argûs. *Roy. Soc. Proc.*, Vol. 68, 1901, pp. 456-458.
- Variable, η Argûs. *Ast. Nach.*, Vol. 155, 1901, 239-240.
- Elemente des Cometen, 1901 a. *Ast. Nach.*, Vol. 155, 1901, 285-286.
- The Oxford photographic determinations of Stellar parallax. Reply to Prof. Turner. *R. A. S. M. N.*, Vol. 61, 1901, pp. 513-521.
- Meridian Observations of Comet-comparison stars. *Ast. Nach.*, Vol. 157, 1902, 95, 96.
- Preliminary note on an apparent rotation of the brighter fixed stars as a whole with respect to fainter stars as a whole. *Ast. Nach.*, Vol. 159, 1902, 117-122.
- Notes on nebulae observed at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 62, 1902, pp. 468-470.
- Cape Double Star results, 1901. *R. A. S. M. N.*, Vol. 62, 1902, pp. 470-484.

- Observations of Comet, 1903, I., made at the Royal Observatory, Cape of Good Hope. *Ast. Nach.*, Vol. 163, 1903, 281-284.
- Geodetic Survey of Rhodesia. *Verhandl. Conf. Erdm.*, Berlin, 1900-1901, pp. 140-142.
- Observations of Comet, 1903, IV., made with the 7-inch Equatorial of the Royal Observatory, Cape of Good Hope, by W. H. Cox. *Ast. Nach.*, Vol. 164, 1904, 139-140 (communicated by D. G.).
- Observations of Comet, 1904 e. *Ast. Nach.*, Vol. 167, 1905, 351-352.
- Astronomy and Geodesy in South Africa. *Science in S. Africa*, 1905, pp. 61-73.
- On the origin and progress of Geodetic Survey in South Africa, and of the African Arc of Meridian. *Brit. Ass. Rep.* for 1905, pp. 228-248 (also in *S. African Journal of Science*, Vol. 1, 1907).
- Observations of the conjunction of Saturn with η^1 Aquarii. *Ast. Nach.*, Vol. 172, 1906, 351-354.
- Presidential Address to the British Association at Leicester. *Brit. Ass. Rep.*, 1907, pp. 3-26; *Nature*, Vol. 76, 1907, pp. 319-327. (Abstract of ditto. in *Observatory*, Vol. 30, 1907, pp. 299-306, 335-339.)
- Über die Bewegung und Verteilung der Sterne im Raume (Vortrag). *Naturwiss. Rundschau*, Vol. 22, 1907.
- A possible connection between earthquakes and great waves at distant localities. *Observatory*, Vol. 31, 1908, pp. 407-411.
- Presidential Address on presenting the Gold Medal of the R.A.S. to Prof. F. Küstner. *R. A. S. M. N.*, Vol. 70, 1910, pp. 395-413.
- Articles Heliometer, Micrometer, Telescope. *Encycl. Britannica*, 11th ed., 1909-1911.
- Presidential Address on the award of the Gold Medal of the R.A.S. to Dr. P. H. Cowell. *R. A. S. M. N.*, Vol. 71, 1911, pp. 368-385.
- The arc of meridian of 30° E. longitude. *Verhandl. Conf. Erdmessung*, Vol. 16, 1909, pp. 219-225.
- L'état actuel de l'Astronomie. *Ciel et Terre*, 1907, pp. 345-359, 451-459; 1908, pp. 503-511, 562-569.
- The azimuth marks of the Cape transit circle. *Observatory*, Vol. 36, 1913, pp. 134, 135.

Papers by Sir David Gill and others (joint papers).

- Gill, D., and Lord Lindsay [Earl of Crawford]. On Lord Lindsay's preparations for observations of the transit of Venus, 1874. *R. A. S. M. N.*, Vol. 33, 1872, pp. 34-43.
- On a new driving clock for equatorials. *R. A. S. M. N.*, Vol. 34, 1874, pp. 35-38.
- On the determination of the solar parallax by observations of Juno at opposition. *R. A. S. M. N.*, Vol. 34, 1874, pp. 279-300.
- Note on the results of Heliometer observations of the planet Juno, to determine its diurnal parallax. *R. A. S. M. N.*, Vol. 37, 1877, pp. 308-309.

- Gill, Mauritius Expedition, 1874. Division I. Determination of the solar parallax by observations of the minor planet Juno (3) at opposition, together with a description of the heliometer used in the observations. *Dun Echt Obs. Pub.*, Vol. 2, 1877, 212 pp.; Vol. 3, 1885, xii.
- Gill, Sir David, and W. L. Elkin, Heliometer determinations of stellar parallax in the southern hemisphere [1884]. *R. A. S. Mem.*, Vol. 48, 1885, pp. 1-194.
- Gill, Sir David, and H. Jacoby, On the determination of the errors of the Cape Reseau, Gautier, No. 8. *Helsingfors Acta*, Vol. 23, 1897, No. 5, 31 pp.
- Gill, Sir David, and J. C. Kapteyn, The Cape photographic durchmusterung for the equinox, 1875. *Cape Obs. Ann.*, Vol. 3, 1896, lxviii + (129) + 649 pp.; Vol. 4, 1897, xxxi + 672 pp.; Vol. 5, 1900, 88 + 671 pp.
- Gill, Sir David, and S. S. Hough, Determinations of personal equation depending on magnitude, made with the transit circle and the heliometer at the Royal Observatory, Cape of Good Hope. *R. A. S. M. N.*, Vol. 67, 1907, pp. 366-380.

In order to make the above List of Papers more complete as a Bibliography, the following works are added:—

GEODETIC SURVEY OF SOUTH AFRICA

- Report of the Geodetic Survey of South Africa, executed by Lieut.-Colonel W. G. Morris, 1883-92, under the direction of David Gill; together with a rediscussion of the survey executed by Sir Thomas Maclear, 1841-48, pp. i.-xiv. [1]-[173], 1-289. 1896.
- Vol. II. Report on a rediscussion of Bailey's and Fourcade's surveys, and their reduction to the system of the Geodetic Survey, by Sir David Gill, pp. i.-xx. 1-257. 1901.
- Vol. III. Report of the Geodetic Survey of part of Southern Rhodesia, executed by Alexander Simms, under the direction of Sir David Gill, pp. i.-xiv. 1-146. 1905.
- Report of the Boundary Survey between British Bechuanaland and German S.W. Africa, executed by Lieut.-Colonel Laffan and Lieuts. Wettstein and Doering, under the direction of Sir David Gill [German and English], pp. i.-v. 1-162. 1906.
- Vol. V. Reports of the Geodetic Survey of the Transvaal and Orange River Colony, executed by Colonel Sir W. G. Morris, and of its connection, by Capt. H. W. Gordon, with the Geodetic Survey of Southern Rhodesia. With a preface and introduction by Sir David Gill, pp. i.-xxxvii. 1-463. 1908.
- Revision of the Cape Photographic Durchmusterung, Parts I., II. and III., made under the direction of Sir David Gill. *Cape Obs. Ann.*, vol. ix. pp. 1-8, 1a-63a, 1b-188b, 1c-86c. 1903.
- Gill, Sir David, A history and description of the Royal Observatory, Cape of Good Hope, pp. i.-cxc. 1-136. 1913.

INDEX

- ABBE, CLEVELAND**, 220
Aberdeen, Earl of, 32
Adams, Prof. J. C., 84, 87; his strong support to C.P.D., 176
Airy, Sir G. B., 55, 57; meets Gill at Aberdeen, 84; interest in Ascension expedition, 87; opinion of Meteorology, 90; letter from, 91; on Radcliffe Observer, 101; letter to, on Newall's offer, 103; letter to, on Mars results, 107; on survey of S. Africa, 118; his advice, 125; Cape report, 127; correspondence, 129; letter to, on death of Sir T. Maclear, 130; letter to, on Newall's offer, 133; letter to, on Heliometer, 133; retires from Greenwich, 136; photographs of Comet, 1882, 137; letters to, 138; on appointments to Cape, 158, 295
 — **Wilfrid**, 138
Albani, Madame, 285
Allis (photographer), 198
Ambronn, 104
Anderson (librarian King's College), 26
 — **James (schoolmaster, Foveran)**, 42
Andrew, Mrs., Gill's musical enthusiasm, 286
Apps (electrician), 55
Arrest, H. d', 58
Ausfeld (Gotha), 55
Auwers, Prof. A., 55; letter to, 61; on Ascension expedition, 96; close relations, 106; undertakes reductions of comparison stars, 189; goes to Cape for heliometer observations, 189, 268; last letter from, 353; death, 353
Awdry, Sir Richard, 179
BACKLUND, DR. OSKAR, Gill's mathematical intuition, 31; Gill's visit to Pulkowa, 105; on Cape Transit Circle, 224; on Gill's character, 307; on Gill's *History of the Cape Observatory*, "Gill's Swan Song," 353.
Baillaud, Mons. B., letter to, on being made Commander of Legion of Honour, 345
Baker, Gerald, early recollections, 8, 30
Bakhuyzen, Prof. H. G. van de Sande, 184
Ball, Sir Robert, succeeds Adams, 213; letter to, on his appointment, 213; speech, 214; funeral of, 356
Balmer, Rev. C., 359
Bannerman, Sir A., 31
Barnard, Prof. E. E., induced to photograph Milky Way from Gill's success with comet, 1882, 136
Bauer, measures photographs for parallax, 135
Black, Alexander (ancestor of Lady Gill), 4
 — **Miss Anne (sister-in-law)**, 41
 — **Miss Bessie (sister-in-law)**, 212; death, 342
 — **Elizabeth (née Garden)**, (mother-in-law), 41; death, 206
 — **Miss Isobel (Lady Gill)**, 41
 — **John (father-in-law)**, 41
 — **William**, 359
Bourdillon, Miss, on life at Ascension, 95
Brasier, Professor, 12
Brodie, John (sculptor), 30, 83
Brown, Prof. Crum, 186
Bruce, Colonel, 125
 — **Dr.**, 359
Brunnow, Dr. F., 61

Brunton, Sir Lauder, attends Gill's last illness, 357

CARPENTER (assistant at Dun Echt), 63, 80

Carruthers, Mrs., *see* Markham, Miss V.

Chamberlain, Right Hon. Joseph, sends Gill to Berlin, 221, 311

Chazal, M. de, 68

Chisholm, Miss, 7

Christie, Sir William, 101, 102; succeeds Airy, 137; letter to, 147; letter to, on Board for Cape, 159; letter to, on Stone's methods, 162; letter to, on discontinuance of financial support to Cape Photographic Durchmusterung, 164; his opposition to C.P.D., 175; hostility to Cape proposals, 178; retires from Greenwich, 343

Chrystal, Professor, 119, 186

Clark, Mr., 26

Clerke, Miss Agnes, 177; visit to Cape, 195; letters to, 196-203; letter to, on McClean's visit, 228; death, 333; various letters to, 363-377.

— Miss Ellen Mary, letter to, 203

Colahan, Mrs., Gill's enjoyment of her piano playing, 284

Colley, Sir George, 115, 120, 238

Common, Dr. A. A., 184

Cooke & Sons, 38, 54, 65

Cookson, Bryan, letter to, advice about becoming astronomer, 232, 236, 313; death, 333

Copeland, Dr. Ralph, 69; letter to, 185

Cottingham, E. T., on clock invented by Gill, 244

Courtney, Mr. (Ministerial Secretary at Treasury), 158

Crawford, Countess of, letter to, 73, 80

— Earl of (25th Earl), invites Gill to be Director of Dun Echt Observatory, 50; urges acceptance of Khedive's offer, 78; death, 130

— Earl of (26th Earl), (formerly Lord Lindsay), 39; first acquaintance, 40; laboratory in London, 48; plans Dun Echt Observatory, 52; letter from, 55; letter to 62; Mauri-

tius Expedition, 67; anecdote, 70; letter to, on Egyptian Survey, 77; death, 82; his character, 81; letter to, on his father's death, 130; death, 333

Crawford, Earl of (27th Earl), 102

DALE, SIR LANGHAM, 119

Dallmeyer (optician), 64, 135

Darwin, Sir George, 214; secures funds to complete survey, 238; death, 333

Davidson, Alexander, early recollections, 11; later memories, 336

De la Rue, Dr. Warren, assistance for establishing Newall telescope, 132

De Sitter, Professor, 188; account of, 234, 236, 357

Döllen, Professor, 75

Dougal, Dr. (head master Dollar Academy), 8

Douglas (ostrich farmer), 231

Draper, Prof. H., letter to, 57

Duff, Gordon, letter to, 145

— Mrs. Gordon, letter to, 143

Dyson, Sir Frank, reminiscences, 323; appointed Astronomer Royal, 343; goes with Gill to Sir R. Ball's funeral, 356

EICHENS (optician), 55

Elkin, Dr. W. L., 104; letter to, on Newall's offer, 132; visits Cape, 134; leaves Cape, 140; letters to, 140; assisted by Gill to obtain heliometer, 153; letter to, on heliometer negotiation, 157, 194; letters to, 217, 219; letter to, on McClean's offer, 226, 236; letter to, on financial losses, 334; letters to, 337-341 (on Newcomb's illness; telescope for Ristenpart; British Association; lectures at Royal Institution); letter to, on optical glass, 349

FAIRBRIDGE, CHARLES, 112
Farquharson, Right Hon. Robert, 32, 359

Finlay, W. H., 188; domestic sorrows, 207

Foerster, Dr. W., letter from, 242

Forbes, Prof. George, recollections of Hamburg meeting of Ast. Gesell., 59

Foster, Sir M., on offer to Gill to succeed Adams, 213

Franklin-Adams, John, 236

Frere, Sir Bartle, 113; tribute from Gill, 115; letter from, 117, 120, 238

Frere, Lady, her tact, 114

— Miss Georgina, recollections, 117

Fuller, Sir Thomas, 119

Furze (artist), letter from, 216

GARDEN, ALEXANDER, 41

Gibbs, assists Gill at Alexandria,

75
Gill, Andrew Mitchell (brother), 5; early recollections, 7; at Sir David's funeral, 359

— David (father), 3, 4, 5; business made over to his son David, 40; death, 100

— David (brother), dies in infancy, 5

— Sir David, parentage, 3; birth, 5; childhood, 6; early taste for science, 7; Dollar Academy, 7; rifle-shooting, 10; love of sports, 11; Marischal College, 11; Clerk Maxwell's opinion, 12; studies mathematics with Dr. Rennett, 15; speech at Aberdeen University Club, 16; enters his father's business, 18; goes to Switzerland, 19; Coventry workshops, 20; Clerkenwell, 21; junior partner, 23; establishes time-signals at Aberdeen, 25; first acquaintance with telescope, 26; becomes lieutenant in Aberdeenshire Rifles, 31; rifle-shooting, 32; buys first telescope, 37; photographs the moon, 39; first acquaintance with Lord Lindsay, 40; meets the future Lady Gill, 41; his engagement, 43; marries Isobel Black, 45; appointed to Dun Echt, 50; invents photographic *réseau*, 56; visit to Pulkowa, 58; proposes heliometer for observations of Juno for solar parallax, 61; Mauritius expedition, 67; geodetic work in Egypt, 76; invited by Khedive to survey Egypt, 78; decides to leave Dun Echt, 81; question of partnership with Howard Grubb, 86; Ascension expedition, action of R.A.S., 87;

accident to heliometer, 88; sails for Ascension, 92; awarded Gold Medal of Royal Astronomical Society, 96; awarded the Valz medal, 96; Lines to his wife, 97; candidate for Radcliffe Observer, 101; appointment as H.M. Astronomer at the Cape, 103; Newall offers 25-inch telescope to Cape, 103; visits to foreign observatories, 104; result of Ascension observations 107; arrives at the Cape, 111; his relations with Sir Bartle Frere, 115; reports on survey of S. Africa, 118; interview with Cecil Rhodes, 122; life at the Cape, 125; buys Lord Lindsay's heliometer, 134; photographs comet *b*, 1882, 135; commences Cape Photographic Durchmusterung, 135; portrait painted by Sir Geo. Reid and Mr. G. Henry, 139; intimacy with Newcomb, 148; visit to England, 1884, 153; obtains Admiralty consent to new heliometer, 156; corresponding member of St. Petersburg Academy, 163; Royal Society cease to support C.P.D., 164; resolves to continue it at his own expense, 164; Kapteyn offers to measure the plates, 167; initiates with Mouchez Astrogaphic Congress, 174; strong opposition to C.P.D., 175 (389); his unselfishness, 176; hostility of Astronomer Royal, 178; cordial support of Hydrographer, 179; third voyage to Cape, 181; obtains Admiralty sanction to astrogaphic scheme, 183; stellar parallax work, 187; determination of solar parallax from Iris, Victoria, and Sappho, 188; Auwers' offer to visit Cape and assist in observations, 189; determines new value of moon's mass, 191; Tisserand's testimony, 192; discouragement by Admiralty of his researches, on advice of Astronomer Royal, 192; triumphs over opposition, 193; visit of Miss Agnes Clerke, 195; corresponding member of Berlin Academy, 206; visit of Knobel to Cape, 207; days of

sorrow, 208; adopts the three sons of deceased sister, 209; honorary fellow of R. Society of Edinburgh, 210; results of Victoria observations, 211; Lowndean Professorship offered but declined, 213; illness of Lady Gill, 215; visit to England, 219; McClean offers 24-inch telescope to Cape, 219; made C.B., 220; attends Congress on National Ephemerides, 221; St. Moritz, 221; proposes new transit circle, 221; discovers magnitude equation, 222; constructs new azimuth marks, 224; details of McClean's offer, 225; visit of McClean to Cape, 228; geodetic survey, 231; advises Cookson on astronomical study, 232; visit of De Sitter, 234; his important geodetic work, 237; visit of British Association to Cape, 239; death of Admiral Sir William Wharton, 241; Member International Committee of Weights and Measures, 242; his "perfect" clock, 243 (376); retirement from the Cape, 244; three great undertakings successfully accomplished, 245; made K.C.B., 251; Cape politics, 252; at Natal for Royal visit, 257; visit to Lord Milner, 260; Carlsbad, 262; illness from diphtheria, 267; personal anecdotes, 268; personal traits and tastes, 280; love of music, 284; religious views, 289; Gilliana, 294; first meeting with Hale, 306; love of sports, 309; deer-stalking, 313; farewell dinner at Athenæum, 317; life at 34 De Vere Gardens, 320; unquestionable greatness of his character, 324; President, Royal Astronomical Society, 327; foreign secretary, 327; continued scientific activity, 327; favours vivisection, 328; his activities at Astrographic Congresses, 332; financial losses, 334; employed by different Governments to advise on instruments, 334; Christmas lectures at Royal Institution, 335; designs telescopes for Johannesburg and Santiago,

338; President British Association, 339; awarded Gold Medal of Royal Astronomical Society, 341; further serious illness of Lady Gill, 342; Hon. Mem. Astronomical and Astrophysical Society of America, 344; *Commandeur de la Légion d'Honneur*, 345; receives German order *Pour le Mérite*, 345; dinner on his seventieth birthday, 347; letter of thanks to Cape Staff, 348; completes *History and Description of the Cape Observatory*, 352; awarded a Royal Medal, 356; attends funeral of Sir Robert Ball, 356; chill probably caught on that occasion, 356; last serious illness, pneumonia and pleurisy, 357; death, 358; profound sorrow, 358; purchased site of grave, 358; funeral at St. Machar Cathedral, Aberdeen, 359; floral tokens from Cape, Greenwich, Paris, Pulkowa, and Mount Wilson, 359; memorial service at St. Mary Abbot, Kensington, 359; Lady Gill's description of grave, 359; Appendix I, letters to Miss Agnes Clerke, 363-377; correspondence with Newcomb, 377-387; letters to Kapteyn, 387-394; letters to Hale, 395-400; list of publications, Appendix II, 401.

Gill, David & Son, 3, 26

— James Bruce (brother), 5; on David's rifle-shooting, 10; 31; letter to, 33; letter to, on visit to Pulkowa, 57; long letter to, on being made K.C.B., shooting experiences, 310

— Lady (wife), parentage, 41; first impressions of David Gill, 42; courtship, 43; marriage, 45; reminiscence of early married life, 46; *Six Months in Ascension*, 92; her devotion at Ascension, 97; serious illness, 215; further serious illness 342; description of Sir David's grave at St. Machar Cathedral, 359

— Margaret (*née* Anderson), (grandmother), 3

— Margaret (*née* Mitchell), (mother), 3, 4, 6; death, 46

- Gill, Margaret (sister), 5; marries Rev. H. Powell, 5, 157; death, 208
 — Patrick (brother), dies in infancy, 5
 — Patrick Gilbert (brother), 5, 32; letter to, 35
 — Peter (grandfather), 3, 4
 Gill & Smith, 3
 Gimingham, C. H., 22
 Gordon, General, anecdote, 124
 —, Hon. J. H., 32
 Gould, Dr. B. A., letter from, 97; letter to, on Cordoba Zone-Catalogue, 165
 Graydon (seaman), letter from, 96
 Gresley, Rev. G. F., 290
 Grey, Earl, reminiscence, 43, 120, 238; various letters from, 297
 Grubb, Sir Howard, 54; letters to, 56, 60 (on *réseau*); question of partnership with Gill, 86; 88; makes McClean telescope, 228; letter to, 344
 Guillaume, his use of the nickel-iron alloy, invar, 237
- HALE, DR. G. E., impressions of first meeting, 306; last letter from, 356; various letters to, 395-400
 Hall, Harvey, note, 10; Gill's rifle shooting, 32; attends funeral, 359
 Hallé, Sir Charles, 285
 Halm, Dr. J., appointed chief assistant, 279; letter from, 279
 Hartwig, Prof. R. E. A., 194
 Haswell, Robert & Son, reminiscences, 21
 Henry, the brothers, 136; letter to, on failure to obtain photographic telescope, 166; optical work, 169, 174
 — George, portrait of Gill by, 139
 Herschel, Lord, 193
 Hill, Canon, funeral service at Aberdeen, 359
 Hills, Colonel E. H., 347, 358
 Hind, J. R., 61, 87
 Hinks, A. R., anecdotes, 304
 Hough, S. S., 222, 230; chief assistant, succeeds Gill as H.M. Astronomer, 244, 278
 Huggins, Sir William, Gill's first photograph of moon sent to, 39, 49; interest in Ascension expedition, 88; on Ascension results, 94, 136; letter to, 165; death, 333
 Hunter, Colin, 30
- INNES, R. T. A., 236; musical recollection, 284
 Israels, Joseph, 30
- JACOBY, H., visits Cape for practical work with heliometer, 206, 236
 Jhalawar, Maharaja of, letter to, 351
 Jones, Thomas (optician), 26
- KAPTEYN, PROF. J. C., note, 39; letter offering to devote some years to Cape Photographic Durchmusterung, 167; discovery of two star streams, 168; first meeting, 171; letters to, on C.P.D., 176, 182; writes obituary, 187; letters to, 212; letter to, on Mrs. Gill's illness, 215; frequent visits to De Vere Gardens, 321; Gill's activities at Astrographic Congresses, 332; letters to, written on Gill's seventieth birthday, 346; various letters to, 387-394
 Kelvin, Lord, first meeting, 22, 24, 178, 289; his views on vivisection, 328
 Kerr, John, his *Memories Grave and Gay*, 84
 Kershaw, Mr., 326
 Key, Rev. H. Cooper, sells reflector to Gill, 37, 86
 Khedive, the, invites Gill to survey Egypt, 78
 Kilgour, George, 124
 Knobel, E. B., letters to, on Cape work, 146; on Astrographic Congress, 172; letters to, on Admiralty consent to proposals, 183; letter to, proposing Miss Clerke as Hon. Member of R.A.S., 204; letters to, 206-210; goes to Cape, 207; letter to, on results of Victoria observations, Solar parallax, and Lunar Equation, 211; anecdote, 274; musical recollection, 284; anecdote of Paris Congress, 304; goes with Gill to Sir R. Ball's funeral, 356
 Küstner, Prof. F., 104

- LAMONT, PROF. J., 56
 Larmor, Sir J., recollection, 303
 Lecson, Mr., anecdote, 303
 Leonard, Miss, anecdote, 288
 Lindsay, Dr. (head master, Dollar Academy), 7, 30
 — Lord, *see* Crawford, Earl of (26th Earl).
 Loch, Lord, 121
 Lockyer, Sir J. N., letters from and to, on removal of Solar Physics Observatory, 351
 Low, Canon W. L., early reminiscences, 44
 Lowe, Mrs., reminiscences of his shooting, 319
 Lowell, Prof. Percival, 335
 Lyons, Major, 76
 Lytton, Lady, anecdote, 285
- MACLAREN, LORD, 119, 186
 Maclear, Sir Thomas, 111; death, 130
 — Lady, 111
 — Miss, 112
 MacMahon, Major, account of Gill at International Conferences, 329
 McClean, Frank, 216; letter from, offering 24-inch equatoreal to Cape, 225; letter to, accepting, 225; visits Cape, 228
 McGee, Dr. A. Newcomb ("F. B.") (daughter of Simon Newcomb), 149
 Main, Rev. Robert, death, 100
 Markham, Miss V., letters to, 255-265
 Marth, A., 147
 Masupha (Basuto chief), 124
 Maxwell, Prof. James Clerk, testimonial from, 12; influence of, 12; lectures on astronomy, 13; proposes wave length of light as standard, 13; Gill's veneration for, 14; reminiscences of, 17; introduces Gill to Lord Kelvin, 22, 30, 289
 Meikleham, Professor, 24
 Meldrum, Charles, 67
 Merriman, Hon. J. X., 119; letter on Cape politics, 252
 Merz (optician), 54
 Millais, Sir J. E., 30
 Milner, Lord, conversation with, 115, 120, 238; letters from, 253
 Mitchell, A. W. (cousin), attends funeral, 359
 Mitchell, Mrs. (aunt), David's attachment to his mother, 6; reminiscences, 42
 — Sir C., 120
 Moir, James, 12
 Morris, Sir W., goes to Cape, 141, 145; letter from, on Gill's recovery from diphtheria, 267
 Mouchez, Admiral, 136; organizes Astrographic Congress, 169, 174, 182
 Muir, Dr., appointed Superintendent-General of Education at Cape, 119
- NASH, W. H. HOWARD, letter to, on religious opinions, 292
 Nasmyth, James, letter to, 20; first meeting, 98; anecdote, 100; promises £1000 towards Newall telescope, 100, 132
 Neaté, Commander, 68
 Newall, R. S., generous offer of 25-inch telescope to Cape, 103, 107; financial support for, 132; proposal abandoned, 133, 227
 Newcomb, Prof. Simon, first meeting, 60, 77; visits Cape, 140, 147; intimacy with Gill, 148; letters to, 149, 150, 153; letter to, on Victoria observations and Lunar Equation, 191; letters to, 192; death, 333; correspondence between, 377-387
 Nicol, Professor, 16
 Niven, C., 62; attends funeral, 359
 Noble, Lady, letter to, on deaths of Sir Fredk. Richards and Sir Geo. Darwin, 343
 — Miss, letter to Lady Gill on Gill's enthusiasm for sport, 318
 Norman Neruda, visits observatory, 285
 Northbrook, Lord, 157
- PENNEFATHER, PREBENDARY, memorial service, 359
 Perry, Rev. S. J., 147
 Peters, 194
 Petrie, Prof. Flinders, Gill's survey of Pyramids, 76; anecdotes, 305
 Phillimore, Captain, 93
 Phillip, John (painter), 30
 Pickering, Prof. E. C., 97
 Pogson, N., 101

- Powell, Bruce, Lieut. (nephew), 209
 — Frederick, Major (nephew), 209
 — Harry, Capt. (nephew), 209; killed at Ypres, 209
 — Mrs., *see* Gill, Margaret (sister).
 Power, J., account of heliometer negotiation with Admiralty, 156; on Gill's holidays and home-comings, 160; close intimacy, 266; interesting notes, 271; letter written on Gill's seventieth birthday, 347
 Pritchard, Prof. C., 165, 199
 RAMBAUT, A. A., 341
 Rankine, Miss (nurse), 313
 Ranyell, Miss, 19
 Reid, Archie, 83
 — Sir George, 30, 83; portrait by, 139, 154, 280; letters from, 281
 Remenyi (violinist), 285, 365
 Rennett, Dr. David (mathematical coach), 12; indebtedness to, 15; notes concerning Gill, 15; anecdote, 16, 30
 Repsold (Hamburg), 54, 155
 Rhodes, Cecil, 119, 120; Gill's impressions of, 122; anecdote, 123
 Richards, Admiral Sir F., first meeting, 112; Gill's indebtedness to, 121; stays with, 219; death, 333, 341
 Ristenpart, F. W., telescope for, designed by Gill, 338
 Ritchie, James, & Son, 25
 Roberts, A. W., reminiscence, 39; letter to, 230; letter to, on retirement from Cape, 240
 Robertson, Major (of Foveran), 5
 Ross, A., 26
 — Donald, 120
 Rutherford, Professor, photographed star groups before 1882, 135
 Ruxton, Dr. J. (cousin), introduces Miss Black (Lady Gill), 41
 ST. JOHNS, BISHOP OF, on Gill's religious views, 289
 Salisbury, Lord, 311
 Sangster & Dunningham, 26
 Santley, Charles, anecdote, 285
 Sauer, Hon. J. W., 124
 Sawerthal, H., 200
 Schjellerup, Prof. H. C. F. C., 58
 Schuessler, L., recollections, 20
 Schur, W., 194
 Sidgreaves, Rev. W., 147
 Siemens, W., promises £250 for Newall telescope, 132
 Simms, James, letter to, on altazimuth, 65, 223
 Smiles, Samuel, 98
 Smith, Sir G. Adam, 358, 359
 — Prof. Robertson, 57, 83
 — Right Hon. W. H., 103
 Smyth, General L., 125
 — Prof. Piazzzi, 25; letter from, on Cape experiences, 108, 155
 Spottiswoode, W., 132
 Stanford, Sir Charles, 287
 Steinheil (Munich), 38
 Stewart, Dr., 231
 Stokes, Sir George, in favour of Cape Durchmusterung, 177, 181; his active support of astrographic scheme, 183
 Stone, E. J., 101; meets Gill at Cape, 111; his methods criticized, 162
 — General, 76, 78
 Storie, A. J. W., 359
 Struve, Prof. Hermann, 104
 — Prof. Otto, letter to, 56, 58, 163
 TABRUN, A. H., letter to, on the Bible and Religion, 292
 Tait, Professor, 289
 Thomson, Prof. David, influence on Gill's astronomical career, 17; great mathematical teacher, 24; small observatory of, 25, 30, 37
 — — James, 24
 — — Sylvanus, 48
 — Sir William, *see* Kelvin, Lord.
 Tietjen, Prof. F., computes planetary perturbations, 191, 194
 Tisserand, F. F., 192
 Trimén, Roland, 112; reminiscences, 302, 303
 Trotter, A. P., anecdotes, 281
 Troughton & Simms, 54
 Tulloch, Dr., 7
 Tupman, Colonel G. L., organizes Transit of Venus expeditions, 66; candidate for Radcliffe Observer, 101
 Turner, Prof. H. H., 184
 UPINGTON, SIR THOS., 126

- WALKER, REV. W., 44
 Walton, Hon. E. H., speech at
 farewell banquet, 308
 Watson, Professor, 75
 — Sir C. M., 75
 Watts, George, 30
 Webster, Mr. (M.P. for Aberdeen),
 84
 Wernher, Mr., subscribes to Sur-
 vey Fund, 238
 Wesley, W. H., account of accident
 at R.A.S., 88; list of publica-
 tions, 401
 Wharton, Admiral Sir W., first
 meeting, 68, 156; effective
 support of Gill's proposals, 179;
 correspondence, 179; supports
 Gill's application for Transit
 Circle, 221; death, 239, 241
 White, James (Kelvin & White), 22
 White, J. F., 85
 Wilson, Arthur, 19
 Winnecke, Prof. F. A. T., 104
 Woods, Ray, 164
 Wooton (clockmaker, Coventry),
 20

135-6



QB

36

G47F6

Forbes, George

David Gill, man and
astronomer

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

ERINDALE COLLEGE LIBRARY
MISSISSAUGA ONTARIO
